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November 7, 2013

North Carolina Department of Environmental and Natural Resources Division of Waste Management Solid Waste Section 1646 Mail Service Center Raleigh, NC 27699-1649

Attn: Ms. Elizabeth Werner

Re: Closure Report for Beneficial Use Structural Fill

Marshall Steam Station

Catawba County, North Carolina Record Number: CCB0072

Dear Ms. Werner,

Attached you will find the closure report for the Beneficial Use Structural Fill at Duke Energy, Marshall Steam Station. This report was completed by S&ME Engineering in accordance with 15A NCAC 13B.1706 – Closure of Structural Fill Facilities.

The intended beneficial use of landfill cell construction and operation will not be required within the time frame originally anticipated. Current facility landfill capacity will be analyzed annually based on landfill space constraints to determine when landfill construction will begin. Therefore, the Structural Fill area was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Landfill construction will proceed as documented in the PTC documents once the need arises

Please contact me if you have any questions or comments.

Respectfully submitted,

Kimberlee Hutchinson, PE Environmental Services

Attachments: Structural Fill Closure Report, Industrial Landfill No. 1 Cells 3 and 4

Electronic Copy of Report

cc: Dean Snyder, Duke Energy George Tolbert, Duke Energy Scott Parks, Duke Energy

### STRUCTURAL FILL CLOSURE REPORT DUKE ENERGY CAROLINAS, LLC – MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1 – PHASE 1, CELLS 3 & 4 PERMIT NO. 1812 CATAWBA COUNTY, TERRELL, NORTH CAROLINA

S&ME Project No. 1356-11-032-06



Prepared for:
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, North Carolina 28202



Prepared by: S&ME, Inc. NC P.E. Firm License No. F-0176

9751 Southern Pine Boulevard Charlotte, North Carolina 28273

November 2013



November 6, 2013

Cliffside Steam Station 573 Duke Power Road Mooresboro, North Carolina 28114

Attention:

Mr. Dean Snyder

Reference:

Cells 3 and 4 Structural Fill Closure Report - Permit ID No. 18-12

Marshall Steam Station Industrial Landfill No. 1

Duke Energy Marshall Steam Station

8320 Highway 150 East, Terrell, Catawba County, North Carolina

S&ME Project No. 1356-11-032, Ph. 6 North Carolina P.E. Firm License No. F-0176

Dear Mr. Snyder:

S&ME is pleased to submit the *Cells 3 and 4 Structural Fill Closure Report* for the Marshall Steam Station Industrial Landfill No. 1 in Terrell, North Carolina. This certification report provides documentation that Cells 3 and 4 structural fill notification was constructed and closed in accordance with Section .1700 of the Solid Waste Rules, the enclosed project drawings and specifications, and related approved documents.

Please contact us should you have any questions or require additional information.

Respectfully Submitted,

S&ME, Inc.

I. Kyle Baucom, P.E.

Project Engineer

NC Registration No. 038555

Jason S. Reeves, P.E.

Senior Project Engineer

NC Registration No. 024486

Cc: Kim Hutchinson, Duke Energy

George Tolbert, Duke Energy Scott Parks, Duke Energy



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### 1. PROJECT DESCRIPTION

### 1.1 Background

The Industrial Landfill No.1 is owned and operated by Duke Energy. The facility is located at Marshall Steam Station in Terrell, North Carolina. The Industrial Landfill No. 1 was permitted for Phase I (Cells 1 through 4) construction under Permit No. 18-12. Cells 1 and 2 are constructed and in the operations phase. The Cells 1 and 2 construction was documented in S&ME's "Cells 1 and 2 Construction Certification Report" dated January 31, 2011, and was approved in NCDENR's "Permit to Operate" dated March 7, 2011.

Remaining consistent with the Permit To Construct (PTC) and other documents submitted to NCDENR, Phase 1 of the landfill development has been planned in the following six stages:

- Stage 1: Cells 1 and 2 subgrade preparation (clearing and grubbing);
- Stage 2: Structural Fill to Cells 1 and 2 subgrade (compliant with .1700 rule regulations);
- Stage 3: Cells 1 and 2 construction and operation;
- Stage 4: Cells 3 and 4 subgrade preparation (clearing and grubbing);
- Stage 5: Structural Fill to Cells 3 and 4 subgrade (compliant with .1700 rule regulations); and,
- Stage 6: Cells 3 and 4 construction and operation.

At the time of this report, Stages 1, 2, 4, and 5 are complete, and Stage 3 is currently ongoing. Structural fill notification was provided for both Stages 2 and 5 .1700 Rules fill in the "Structural Fill Facility Notification" dated May 29, 2010, and a subsequent update for Stage 5 construction was provided in the "Structural Fill Facility Notification Update" dated March 16, 2012. Within these previous reports, the siting criteria for the structural fill was discussed in detail and in general accordance with 15A NCAC 13B.1704. The report herein is being prepared to document the completion of Stage 5 construction consistent with 15A NCAC 13B.1705 and 15A NCAC 13B.1706.

During Stage 5 construction, it was determined that the future Stage 6 landfill cell construction and operation will not be required within the time frame originally anticipated. The landfill capacity will be analyzed annually based on landfill space construction area was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Stage 6 construction will proceed as documented in the PTC documents once the need arises.

This report is intended to document the completion of Stage 5 construction in general accordance with 15A NCAC 13B.1705, and the temporary closure of the structural fill in general accordance with 15A NCAC 13B.1706. Pertinent CQA documentation, including

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earthworks field and laboratory test results, record drawings, and project documentation are included in the Appendices.

### 1.2 Design and Operations

The structural fill was designed, operated, and constructed utilizing various environmental protection controls. Ash was moisture conditioned, collected, and transported to the site in a manner that prevented nuisances and hazards to public health and safety. Ash was generated on-site and was transported solely on Duke Energy property to the site. Once the ash material was placed, water trucks were regularly utilized to moisture condition the ash for both dust control, as well as to aid in meeting the compaction and moisture requirements for material placement.

During operations, surface water runoff was diverted away from the active ash placement areas to aid in minimizing erosion and sedimentation. Prior to the commencement of construction, an Erosion and Sediment Control (E&SC) Plan was prepared and approved by NCDENR Land Quality Section to minimize erosion, sedimentation, and stormwater runoff discharges. In addition, stormwater runoff discharges were contained within Duke Energy property and ultimately conveyed to a discharge point at the existing ash basin (NPDES Permit #NC004987).

### 1.3 Construction

Construction generally consisted of earthworks activities largely involved excavation and placement of subgrade fill, structural fill soil cover, and topsoil/vegetative soil cover. Subgrade fill was performed in accordance with .1700 rules by the SEFA Group beginning in April 2012 and ending in March 2013. Subgrade fill placement was performed in accordance with .1700 rules by Charah beginning April 27, 2012 and ending September 12, 2013. Subgrade filling operations performed by SEFA were monitored by S&ME, while subgrade fill operations performed by Charah were monitored by ESP Associates (ESP). Subgrade fill was placed in uniform and compacted one-foot thick lifts to meet the compaction and moisture requirements. The southern perimeter subgrade fill slopes were constructed at approximate 3 horizontal to 1 vertical (3H:1V).

Structural fill soil cover and topsoil/vegetative soil cover placement was performed by Charah beginning August 5, 2013 and ending October 16, 2013. S&ME monitored construction activities and provided testing services during structural fill soil cover and topsoil/vegetative soil cover placement. Construction activities are discussed in further detail in subsequent sections of this report.

### 1.4 Closure

As previously mentioned, the structural fill was covered with a temporary cover system consisting of 12 inches of compacted earth and 6 inches of soil capable of supporting native plant growth consistent with 15A NCAC 13B.1705. Once the need for full-scale landfill construction arises, the structural fill will be permanently covered with a double liner system consistent with the approved PTC documents.

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To prevent ponding of surface water, stormwater drainage generally slopes at a 4 percent slope across the top deck area to a diversion channel that conveys flow from the north end of the site to a downdrain at the south end of the site. To minimize erosion, the site was stabilized with erosion control matting, vegetation, and riprap.

### 1.5 Certification

Observation and testing results by S&ME, Inc. and review of observation and testing results by others indicated that the structural fill closure was completed in general accordance with the .1700 rules and project documents. A Construction Certification Statement signed and sealed by the Engineer of Record for the design and construction, a registered Professional Engineer in the State of North Carolina, is included as an upfront document in this report.

### 2. CONSTRUCTION

Earthworks construction activities included excavation and placement of three different material types: subgrade fill; structural fill soil cover; and topsoil/vegetative soil cover. Material descriptions and general construction procedures for the three material types are summarized in Sections 2.1 through 2.3. Earthworks construction observation and testing activities are summarized in Section 2.4.

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### 2.1 Subgrade Fill

The subgrade fill material definition and subgrade fill general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

### 2.1.1 Material

Subgrade fill is defined as compacted fill placed to achieve proposed liner system subgrade elevations. Subgrade fill primarily consisted of conditioned ash from the silos near the plant.

### 2.1.2 Construction

Subgrade fill was performed in accordance with .1700 rules by the SEFA Group beginning in April 2012 and ending in March 2013. Subgrade filling was performed in accordance with .1700 rules by Charah beginning in April 2013 and ending in September 2013. Based on the comparison of pre- and post- topographic surveys, approximately 340,853 cubic yards of material were placed to complete the Cells 3 and 4 subgrade fill. The subgrade fill was compacted to meet the requirements specified in the referenced notification. The southern perimeter subgrade fill slopes were constructed at approximate 3 horizontal to 1 vertical (3H:1V).

### 2.2 Structural Fill Soil Cover

The structural fill soil cover material definition and general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

### 2.2.1 Material

Structural fill soil cover is defined as compacted soil required for perimeter berms, surface water control systems, and the lower 12 inches of the structural fill cover system. Structural fill consisted of on-site borrow soils that were free of organic material, refuse or debris.

### 2.2.2 Construction

Structural fill construction for Cells 3 and 4 was performed by Charah beginning August 14, 2013 and ending October 16, 2013. Based on the comparison of pre- and post-topographic surveys, approximately 14,998 cubic yards of soil were placed as structural fill soil cover for Cells 3 and 4 construction. The structural fill was compacted to meet the specified project requirements. The majority of structural fill was constructed as the lower 12 inches of the structural fill cover system.

### 2.3 Topsoil/Vegetative Soil Cover

The topsoil/vegetative soil cover material definition and general construction procedures are summarized in this section. Observation and testing results are reported in Section 2.4.

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### 2.3.1 Material

Topsoil/vegetative soil cover is defined as soil fill placed within the upper 6 inches of the structural fill cover system. Topsoil/vegetative soil cover consisted of on-site borrow soil that is free of refuse or debris.

### 2.3.2 Construction

Topsoil/vegetative soil cover construction for Cells 3 and 4 was performed by Charah during September and October 2013. Based on the comparison of pre- and post-topographic surveys, approximately 8,298 cubic yards of soil were placed as topsoil/vegetative soil cover for Cells 3 and 4 construction.

### 2.4 Observation & Testing

S&ME and ESP observed, monitored, and provided field and laboratory testing during earthworks construction on a part-time basis for the cover system. Borrow soils used during construction were monitored to evaluate that the materials conformed to the project specifications.

Field and laboratory testing were performed at the specified frequencies summarized in this section. Field and laboratory testing frequency requirements are stated per volume of material and are based on lift area and thickness requirements provided in the specifications. Tables 1 and 2 summarize frequency verification for field and laboratory testing of earthworks.

### 2.4.1 Field Observation & Testing - Subgrade and Structural Fill

Field testing consisted of performing field density tests using the drive cylinder method (ASTM D2937) and moisture content tests (ASTM D2216). S&ME monitored subgrade fill operations from April 2012 through March 2013 and cover system structural fill placement from August 2013 through October 2013. ESP monitored subgrade fill operations from April 2013 through July 2013. Field density tests were performed at the following frequency with the specified moisture-density requirements:

sture	Density

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Soil Type	Frequency	Moisture Requirement	Density Requirement
Subgrade Fill	1 test per 5,000 CY	±3% of OMC <sup>2</sup>	95% Standard Proctor MDD <sup>3</sup>
Structural Fill	1 test per 807 CY <sup>1</sup>	±3% of OMC <sup>2</sup>	95% Standard Proctor MDD <sup>3</sup>

Frequency based on one test every lift 43,560 square feet in area, and with a thickness of 0.5 feet

Field density test results for the subgrade and structural fill are included in Appendix I, Sections 1 and 2, respectively.

The field density tests were compared with standard Proctor tests performed previously on similar materials to estimate relative compaction of the material at the tested locations. During the initial stages of subgrade fill placement, the field density tests were compared with standard Proctor tests performed previously on material placed in Cells 1 and 2 during landfill operations (S-1 through S-6). As subgrade fill progressed, the field density tests were compared with standard Proctor tests performed on material placed in the Cells 3 and 4 structural fill (SG-1 through SG-18). The laboratory test results are included in Appendix I, Section 1.

Ninety-three (93) field density tests were performed on the subgrade fill that met both density and moisture requirements. An additional thirteen (13) field density tests met density requirements, but were slightly outside the project moisture requirements. Those tests were accepted, since the density requirements were met. Referencing Table 1, the number of passing tests exceeded the sixty-nine (69) tests required to meet the specified frequency.

Twenty-one (21) field density tests were performed on the structural fill that met both density and moisture requirements. Referencing Table 1, the number of passing tests exceeded the nineteen (19) tests required to meet the specified frequency.

Based on in-place material quantities, the number of passing field tests, as reported in Table 1, met the required testing frequencies for the subgrade and structural fill placement.

### 2.4.2 Laboratory Testing (Subgrade and Structural Fill)

Subgrade fill testing was generally performed at a frequency of one suite of tests per 20,000 cubic yards and structural fill laboratory testing was performed at a frequency of approximately one suite of tests per 10,000 cubic yards of material placed.

<sup>&</sup>lt;sup>2</sup>Optimum moisture content as determined by standard Proctor (ASTM D698) testing <sup>3</sup>Maximum dry density as determined by standard Proctor (ASTM D698) testing

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In general, each suite of tests included the following:

- Water (Moisture) Content (ASTM D2216);
- Particle Size (ASTM D422);
- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM D4318); and
- Standard Proctor Compaction (ASTM D698).

Laboratory test results for the subgrade and structural fill are included in Appendix I, Sections 1 and 2, respectively. The subgrade laboratory test results are provided in Appendix I, Section 1. The quantity of subgrade and structural fill material placed and the number of laboratory tests conducted are reported in Table 2.

Approximately 340,853 cubic yards of subgrade fill were placed. To meet the specified frequency of 1 suite of tests per 20,000 cubic yards of material, 17 tests would be required. Eighteen (18) test suites were performed on the subgrade material; therefore, the specified testing frequency was met.

Approximately 14,998 cubic yards of structural fill soil cover were placed. To meet the specified frequency of 1 suite of tests per 10,000 cubic yards of material, two (2) tests would be required. Seven (7) test suites were performed on the structural fill soil cover; therefore, the specified frequency was met.

### 2.4.3 Field Observation & Testing (Topsoil/Vegetative Soil Cover)

S&ME observed and monitored during topsoil/vegetative soil cover construction on a part-time basis. Topsoil/vegetative soil cover was observed to verify that the material was refuse and debris.

The structural fill cover system soil cover thickness of 18 inches was also verified through surveying. The thickness was verified by comparing the elevations of subgrade (top of ash) survey points with cover system (top of soil) survey points at similar northing and easting locations and calculating the elevation difference. WSP provided survey data that was obtained on an approximate 100-foot by 100-foot grid with individual survey points also obtained at slope breaks. Soil cover thickness verification as-built drawings and summary tables are included in Appendix I, Section 3. The thickness verification data indicates that the minimum 18-inch thick soil cover thickness was achieved.

### 2.4.4 Laboratory Testing (Topsoil/Vegetative Soil Cover)

Topsoil/vegetative soil cover laboratory testing was performed to obtain soil amendment recommendations for seeding over the cover system.

Laboratory test results for the topsoil/vegetative soil cover are included in Appendix I, Section 3.

### 3. PROJECT DOCUMENTATION

Construction activities and project progress were documented throughout construction. While on site, S&ME engineering staff and technicians observed and documented construction activities as summarized in daily field reports and photographs. The project documentation information and project drawings and specifications are included in Appendix II.

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November 2013

### CONSTRUCTION CERTIFICATION STATEMENT FOR DUKE ENERGY – MARSHALL STEAM STATION

### INDUSTRIAL LANDFILL NO. 1 CELLS 3 AND 4 STRUCTURAL FILL CLOSURE REPORT

OWNER: DUKE ENERGY OPERATOR: DUKE ENERGY

by:

S&ME, Inc. 9751 Southern Pine Boulevard Charlotte, North Carolina 28273-5560

I hereby certify that the results of periodic construction quality assurance (CQA) activities conducted by S&ME Inc. and review of testing by others, as summarized in this report, indicate that the Marshall Steam Station Industrial Landfill No. 1 Cells 3 and 4 structural fill (NCDENR #CCB0072) was constructed and closed in general accordance with the requirements of Section .1700 of the Solid Waste Rules and the project drawings and specifications.

CAROLLESSION SEAL TO S

1. Kyle Baucom, P.E. N.C. Registration No. 038555

TABLE 1

EARTHWORKS FIELD TESTING FREQUENCY VERIFICATION

DESCRIPTION	TEST STANDARD	CELLS 3 AND 4 IN-PLACE VOLUME ESTIMATE	PROJECT SPECIFICATIONS	FREQUENCY	NUMBER OF TESTS IN CELLS 3 AND 4		
		(CY)	STECHTO: III	(1 test per X CY)	REQUIRED	PASSING	
Subgrade Fill (.1700 Rules Fill)							
Nuclear or Drive-Cyliner Density	ASTM D 6938 or ASTM D 2937	340,853	95% Standard Proctor MDD	5,000	69	92	
Moisture Content	ASTM D 2216	340,633	+ or - 3% of OMC	3,000	09	92	
Structural Fill							
Nuclear or Drive-Cyliner Density	ASTM D 6938 or ASTM D 2937	14,998	95% Standard Proctor MDD	807¹	19	21	
Moisture Content	ASTM D 2216	14,770	+ or - 3% of OMC	807	19	21	

<sup>1.</sup> Frequency based on 1 test every lift 43,560 square feet in area, and with a thickness of 0.5 feet.

TABLE 2
EARTHWORKS LABORATORY TESTING FREQUENCY VERIFICATION

		CELLS 3 AND 4	LAB TEST	NUMBER OF TESTS IN CELLS 3 AND 4		
DESCRIPTION	TEST STANDARD	IN-PLACE VOLUME ESTIMATE (CY)	FREQUENCY (per CY)	REQUIRED	PASSING	
Subgrade Fill (.1700 Rules Fi				1		
Moisture Content	ASTM D 2216			17	18	
Grain-size with Hydrometer	ASTM D 422	340,853	20,000	17	18	
Atterberg Limits	ASTM D 4318	340,633	20,000	17	18	
Standard Proctor	ASTM D 698			17	18	
Structural Fill						
Moisture Content	ASTM D 2216			2	7	
Grain-size with Hydrometer	ASTM D 422	14,998	10,000	2	7	
Atterberg Limits	ASTM D 4318	14,990	10,000	2	7	
Standard Proctor	ASTM D 698			2	7	

# **APPENDIX I – EARTHWORKS** Section 1 – Subgrade Section 2 – Structural Fill Soil Cover Section 3 – Topsoil/Vegetative Soil Cover

# **APPENDIX I – EARTHWORKS Section 1 – Subgrade Subgrade Fill Field Density Test Results Subgrade Fill Laboratory Test Results Cells 1 & 2 Operations Laboratory Test Results** Final Subgrade As-Built Drawing

### **Subgrade Fill Field Density Test Results**





Page No.

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

	Test	In-Pl	ace Densi	ity Test	Check I	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
1	05/17/12	D 2937	82.4	28.7	76.7	21.4	698CP	SG-1	79.5	26,3	95	100+	C2	
2	05/17/12	D 2937	80.5	23.4	76.7	21.4	698CP	SG-1	79.5	26.3	95	100+	D2	
3	05/17/12	D 2937	81.7	26.9	76.7	21.4	698CP	SG-1	79.5	26.3	95	100+	D3	
4	05/21/12	D 2937	73.8	25.0	71.4	22.9	698CP	S-4	75.8	27.7	95	97	B4	
5	05/21/12	D 2937	76.8	27.4	72.8	23.3	698CP	S-4	75.8	27.7	95	100+	C4	
6	05/21/12	D 2937	78.6	30.0	75.9	25.1	698CP	S-5	77.4	27.8	95	100+	C3	
7	05/23/12	D 2937	76.4	29.4	71.5	20.9	698CP	S-4	75.8	27.7	95	100+	C2	
8	05/23/12	D 2937	73.7	27.8	72.7	22.2	698CP	S-4	75.8	27.7	95	97	D2	
9	05/23/12	D 2937	68.4	28.6	67.0	21.1	698CP	S-1	73.2	32.8	95	93 *	D3	
10	05/23/12	D 2937	73.0	30.4	72.7	22.2	698CP	S-4	75.8	27.7	95	96	Retest of #9	
11	05/29/12	D 2937	73.9	26.8	72.5	24.7	698CP	S-6	74.7	29.5	95	99	C4	
12	05/29/12	D 2937	75.2	29.3	71.8	22.5	698CP	S-4	75.8	27.7	95	99	D4	
13	05/29/12	D 2937	74.2	28.0	71.8	22.5	698CP	S-4	75.8	27.7	95	98	C3	
14	06/01/12	D 2937	72.4	31.9	70.9	26.3	698CP	S-1	73.2	32.8	95	99	C4	
15	06/01/12	D 2937	70.9	30.7	70.9	26.3	698CP	S-1	73.2	32.8	95	97	D4	
16	06/01/12	D 2937	74.4	34.5	70.8	28.5	698CP	S-1	73.2	32.8	95	100+	C3	
17	06/01/12	D 2937	73.3	33.2	70.8	28.5	698CP	S-1	73.2	32.8	95	100	D3	
18	06/15/12	D 2937	76.0	25.2	74.0	22.9	698CP	S-5	77.4	27.8	95	98	C2	
19	06/15/12	D 2937	76.6	26.1	74.0	22.9	698CP	S-5	77.4	27.8	95	99	D2	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer



Page No. 2

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

	Test	In-Pl	ace Densi	ity Test	Check I	Plug Data	1	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
20	07/05/12	D 2937	74.5	22.2	73.8	20.8	698CP	S-2	77.5	27.0	95	96	C2	
21	07/05/12	D 2937	75.4	27.8	71.8	20.0	698CP	S-4	75.8	27.7	95	99	C3	
22	07/05/12	D 2937	74.6	26.5	71.8	20.0	698CP	S-4	75.8	27.7	95	98	C4	
23	07/12/12	D 2937	73.8	27.3	68.8	21.3	698CP	S-6	74.7	29.5	95	99	B3	
24	07/12/12	D 2937	74.7	28.2	68.8	21.3	698CP	S-6	74.7	29.5	95	100	B4	
25	07/23/12	D 2937	76.8	27.4	72.3	20.5	698CP	SG-2	77.0	27.7	95	100	B-1	
26	07/23/12	D 2937	74.1	26.0	73.0	23.9	698CP	S-4	75.8	27.7	95	98	B-2	
27	07/23/12	D 2937	77.1	28.7	72.3	20.5	698CP	SG-2	77.0	27.7	95	100	B-3	
28	07/23/12	D 2937	74.7	27.0	73.0	23.9	698CP	S-4	75.8	27.7	95	99	B-4	
29	07/30/12	D 2937	72.1	27.9	71.1	23.8	698CP	S-6	74.7	29.5	95	97	BI	
30	07/30/12	D 2937	74.0	29.8	71.1	23.8	698CP	S-6	74.7	29.5	95	99	B2	
31	07/30/12	D 2937	74.1	28.6	71.1	23.8	698CP	S-6	74.7	29.5	95	99	C2	
32	08/15/12	D 2937	74.6	25.6	73.6	25.6	698CP	SG-2	77.0	27.7	95	97	D3	
33	08/15/12	D 2937	76.2	30.5	73.1	23.7	698CP	SG-2	77.0	27.7	95	99	D4	
34	09/11/12	D 2937	75.0	27.8	74.2	26.6	698CP	S-4	75.8	27.7	95	99	C1	
35	09/11/12	D 2937	75.5	28.9	74.2	26.6	698CP	S-4	75.8	27.7	95	100	D1	
36	09/13/12	D 2937	72.8	27.1	70.6	23.4	698CP	SG-6	74.5	29.5	95	98	B1	
37	09/13/12	D 2937	73.6	27.7	70.6	23.4	698CP	SG-6	74.5	29.5	95	99	C2	
38	09/13/12	D 2937	75.0	29.1	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	D2	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer



Page No. 3

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

7	Test	In-Pl	ace Densi	ty Test	Check I	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
39	09/13/12	D 2937	75.2	28.6	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	C3	
40	09/13/12	D 2937	75.4	30.4	72.7	26.4	698CP	SG-6	74.5	29.5	95	100+	D3	
41	09/21/12	D 2937	73.6	26.1	70.3	20.5	698CP	SG-2	77.0	27.7	95	96	DI	
42	09/21/12	D 2937	74.0	22.1	70.3	20,5	698CP	SG-2	77.0	27.7	95	96	D2	
43	09/21/12	D 2937	75.1	27.3	70.3	20.5	698CP	SG-2	77.0	27.7	95	98	D3	
44	09/21/12	D 2937	79.1	29.7	74.8	20.8	698CP	SG-3	78.9	26.9	95	100	D4	
45	09/21/12	D 2937	73.6	25.3	70.3	20.5	698CP	SG-2	77.0	27.7	95	96	Retest of Tests #42	
46	09/28/12	D 2937	77.0	24.5	73.9	19.5	698CP	SG-1	79.5	26.3	95	97	D4	
47	09/28/12	D 2937	75.4	23.8	73.9	19.5	698CP	SG-1	79.5	26.3	95	95	D3	
48	09/28/12	D 2937	77.4	25.1	73.9	19.5	698CP	SG-1	79.5	26.3	95	97	D2	
49	10/03/12	D 2937	76.1	24.0	74.8	24.0	698CP	SG-3	78.9	26.9	95	96	D3	
50	10/03/12	D 2937	78.3	27.3	77.3	23.6	698CP	SG-1	79.5	26.3	95	99	D4	
51	10/03/12	D 2937	77.0	25.3	74.8	24.0	698CP	SG-3	78.9	26.9	95	98	C3	
52	10/03/12	D 2937	78.5	26.9	77.3	23.6	698CP	SG-1	79.5	26.3	95	99	C4	
53	10/08/12	D 2937	78.5	27.9	74.3	22,5	698CP	SG-3	78.9	26.9	95	99	C3	
54	10/08/12	D 2937	78.9	28.2	74.3	22.5	698CP	SG-3	78.9	26.9	95	100	C4	
55	10/08/12	D 2937	75.3	31.0	71.6	24.6	698CP	SG-6	74.5	29.5	95	100+	B4	
56	10/22/12	D 2937	78.2	25.3	74.8	20.0	698CP	SG-8	78.9	25.8	95	99	C3	
57	10/22/12	D 2937	75.6	24.4	73.0	21.3	698CP	SG-3	78.9	26.9	95	96	D3	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer



Page No. 4

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

	Test	In-Pl	ace Densi	ty Test	Check I	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Type	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
58	10/22/12	D 2937	75.5	23.8	73.0	21.3	698CP	S6-8	78.9	25.8	95	96	D4	
59	10/22/12	D 2937	77.9	25.1	74.8	20.0	698CP	SG-8	78.9	25.8	95	99	C4	
60	11/01/12	D 2937	78.7	25.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	99	CI	
61	11/01/12	D 2937	82.2	23.8	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	CI	
62	11/01/12	D 2937	81.7	25.3	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	C1	
63	11/01/12	D 2937	81.5	24.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	100+	CI	
64	11/01/12	D 2937	79.5	25.7	77.1	23.6	698CP	SG-1	79.5	26.3	95	100	CI	
65	11/01/12	D 2937	79.6	25.2	77.1	23.6	698CP	SG-1	79.5	26.3	95	100	C1	
66	12/11/12	D 2937	74.4	25.5	70.8	26.2	698CP	SG-6	74.5	29.5	95	100	D2	
67	12/11/12	D 2937	72.8	21.6	73.0	20.3	698CP	SG-2	77.0	27.7	95	95	D2	
68	12/11/12	D 2937	76.0	19.3	74.4	19.7	698CP	SG-3	78.9	26.9	95	96	D2	
69	12/11/12	D 2937	73.7	19.8	74.6	20.0	698CP	SG-3	78.9	26.9	95	93 *	D3	
70	12/11/12	D 2937	71.7	19.7	73.0	20.0	698CP	SG-2	77.0	27.7	95	93 *	D3	
71	12/11/12	D 2937	73.6	19.6	73.0	20.0	698CP	SG-2	77.0	27.7	95	96	D3	
72	12/11/12	D 2937	73.4	22.4	74.6	20.0	698CP	SG-3	78.9	26.9	95	93 *	Retest of Test #69	
73	12/11/12	D 2937	74.1	22.0	73.0	20.0	698CP	SG-2	77.0	27.7	95	96	Retest of Test #72	
74	12/27/12	D 2937	80.6	28.1	80.6	24.3	698CP	SG-4	81.7	25.3	95	99	D3	
75	12/27/12	D 2937	83.8	28.8	80.6	24.3	698CP	SG-4	81.7	25.3	95	100+	D3	
76	12/27/12	D 2937	75.9	18.8	77.3	23.0	698CP	SG-1	79.5	26.3	95	95	D3	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer



Page No. 5

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

- 19	Test	In-Pl	ace Densi	ty Test	Check I	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
77	12/27/12	D 2937	80.8	25.4	77.3	23.0	698CP	SG-1	79.5	26.3	95	100+	C2	
78	12/27/12	D 2937	77.8	28.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	98	C2	
79	12/27/12	D 2937	79.5	29.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	100	C2	
80	12/27/12	D 2937	76.8	20.1	77.3	23.0	698CP	SG-1	79.5	26.3	95	97	Retest of Test #76	
81	01/31/13	D 2937	81.2	22.7	82.7	22.9	698CP	SG11	84.2	24.0	95	96	C2	
82	01/31/13	D 2937	77.0	23.2	82.5	22.1	698CP	SG11	84.2	24.0	95	91 *	C2	
83	01/31/13	D 2937	75.5	21.8	82.5	22.1	698CP	SG11	84.2	24.0	95	90 *	C3	
84	01/31/13	D 2937	77.4	22.1	80.6	22.4	698CP	SG11	84.2	24.0	95	92 *	D3	
85	01/31/13	D 2937	76.4	18.0	79.1	17.5	698CP	SG11	84.2	24.0	95	91 *	D2	
86	01/31/13	D 2937	79.2	20.7	79.1	17.5	698CP	SG11	84.2	24.0	95	94 *	D3	
87	02/06/13	D 2937	83.2	22.0	81.4	21.5	698CP	SGII	84.2	24.0	95	99	Retest of Test No. 82, C2	
88	02/06/13	D 2937	81.2	20.9	81.4	21.5	698CP	SG11	84.2	24.0	95	96	Retest of Test No. 83, C3	
89	02/06/13	D 2937	84.1	25.1	81.4	21.5	698CP	SG11	84.2	24.0	95	100	Retest of Test No. 86, D3	
90	02/06/13	D 2937	84.5	21.1	81.4	21.5	698CP	SG11	84.2	24.0	95	100	Retest of Test No. 85, D2	
91	02/06/13	D 2937	83.0	22.9	81.4	21.5	698CP	SG11	84.2	24.0	95	99	Retest of Test No. 84, D3	
92	02/27/13	D 2937	86.5	27.5	86.8	20.0	698CP	SG14	88.8	21.6	95	97	C3	
93	02/27/13	D 2937	89.8	24.0	86.8	20.0	698CP	SG14	88.8	21.6	95	100+	C3	
94	02/27/13	D 2937	92.1	21.8	86.8	20.0	698CP	SG14	88.8	21.6	95	100+	D3	111
95	02/27/13	D 2937	83.7	21.5	82.4	23.1	698CP	SG11	84.2	24.0	95	99	C2	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Ze Garature
Signature

Project Engineer



Page No. 6

Report Date: November 06, 2013

Project No.: 1356-11-032SG

Project Name: Marshall Ind.LF #1-Cells 3-4Co

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

	Test	In-Pl	ace Densi	ty Test	Check I	Plug Data	F	Referenc	e Stand	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
96	02/27/13	D 2937	84.7	24.0	82.4	23.1	698CP	SG11	84.2	24.0	95	100+	C2	
97	02/27/13	D 2937	84.6	22.7	82.4	23.1	698CP	SG11	84.2	24.0	95	100	D2	
98	03/15/13	D 2937	80.2	21.6	81.5	21.4	698CP	SG11	84.2	24.0	95	95	C2	
99	03/15/13	D 2937	82.6	22,3	81.5	21.4	698CP	SG11	84.2	24.0	95	98	C2	
100	03/15/13	D 2937	87.3	23.1	82.8	16.3	698CP	SG14	88.8	21.6	95	98	C2	
101	03/15/13	D 2937	89.3	23.5	82.8	16.3	698CP	SG14	88.8	21.6	95	100+	C2	
102	03/15/13	D 2937	85.0	22.5	82.8	16.3	698CP	SG14	88.8	21.6	95	96	C2	
103	03/15/13	D 2937	81.7	21.3	81.5	21.4	698CP	SG11	84.2	24.0	95	97	C2	
104	04/30/13	D 2937	67.0	22.2	70.3	20.3	698CP	SG-6	74.5	29.5	95	90 *	CI	
105	04/30/13	D 2937	66.4	21.9	70.3	20.3	698CP	SG-6	74.5	29.5	95	89 *	CI	
106	05/17/13	D 2937	83.0	21.4	85.7	21.1	698CP	SG13	86.7	22.7	95	96	D2	
107	05/17/13	D 2937	68.1	22.8	69.9	23.6	698CP	SG-5	72.6	32.2	95	94 *	D2	
108	05/17/13	D 2937	72.5	28.5	73.0	25.3	698CP	SG-6	74.5	29.5	95	97	D2	
109	05/17/13	D 2937	81.6	20.1	84.5	20.7	698CP	SG13	86.7	22.7	95	94 *	D2	
110	05/17/13	D 2937	69.5	22.4	69.9	23.6	698CP	SG-5	72.6	32.2	95	96	Retest of Test 107; D2	
111	05/17/13	D 2937	83.4	22.6	84.5	20.7	698CP	SG13	86.7	22.7	95	96	Retest of Test 109; D2	
112	05/17/13	D 2937	78.0	22.7	79.0	21.5	698CP	SG10	80.7	25.1	95	97	DI	
113	05/17/13	D 2937	74.7	24.6			698CP	SG3	78.9	26.9	95	95	DI .	
114	05/17/13	D 2937	75.1	24.0			698CP	SG-3	78.9	26.9	95	95	D1	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

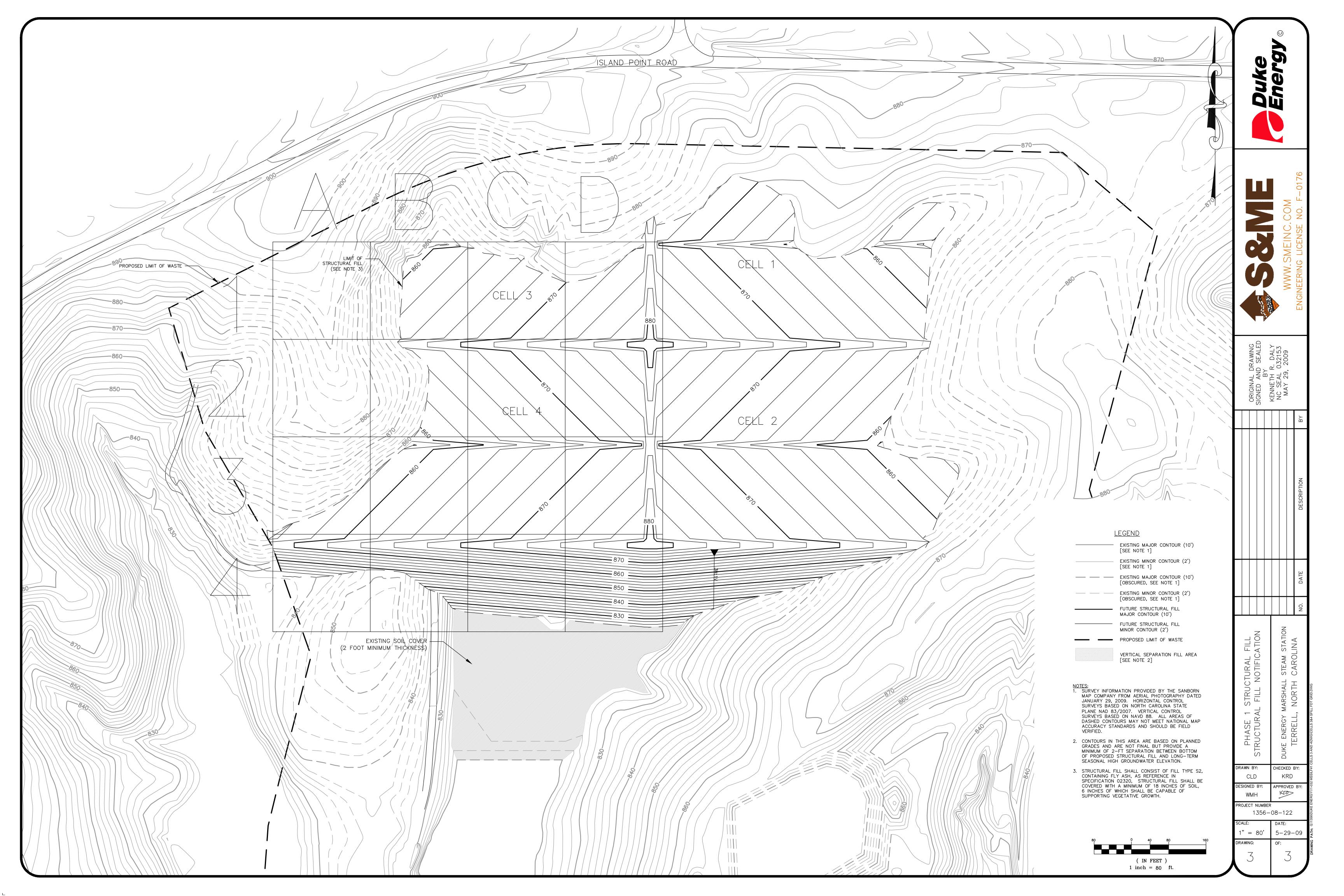
Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer





### ESP Associates, P.A.

3475 Lakemont Blvd

Fort Mill, SC 29708

Ph: (803) 802-2440

Fax: (803) 802-2515

www.espassociates.com

### REPORT OF FIELD DENSITY TESTS

Project:

Marshall Ash Landfill

Client:

Charah, Inc. BP21,301

ESP Project No: Report Date;

August 14, 2013

Page:

l of l

TEST #	DATE	TYPE OF TEST	MAXIMUM DRY GENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	IN-PLACE WET DENSITY (PCF)	IN-PLACE MOISTURE CONTENT (%)	IN-PLACE ORY DENSITY (PCF)	PERCENT COMPACTION (%)	LOCATION	APPROXIMATE ELEVJOEPTH (FT)	Test Specilic Comment	Test # Linked to Comment(s):
1	4/26/13	NG	90.6	20.8	109.2	21.3	90.0	89	Cell #4, approximately center	existing ash elevation	Practor S-2	
2	4/26/13	NG	90.8	20.8	105.3	20.1	87.6		Cell #3, approximately center	existing ash elevation	Proctor S-2	1
3	4/26/13	דם	90.8	20.8	106,8	21.3	88,0		Cell #4, approximately center	existing ash elevation	Practor S-2	
5	6/21/13	DΤ	80.0	27.0	95.1	24.0	76.7		Cell #3, approximately center	existing ash elevation	Proctor S-1	Add and All Processing Control
6	6/21/13	DT	80.0	27.0	97,5	24.3	78.4	66	Cell #4, approximately center	existing ash elevation	Proctor S-1	
				***************************************	The same of the sa				1			
~ <del></del>												
								~~~				

TYPE OF TEST
SC: SAND CDNE
DT: DRIVE TUBE
NG: NUCLEAR GAUGE
RB: RUBBER BALLOON

 REMARKS	

### **Subgrade Fill Laboratory Test Results**



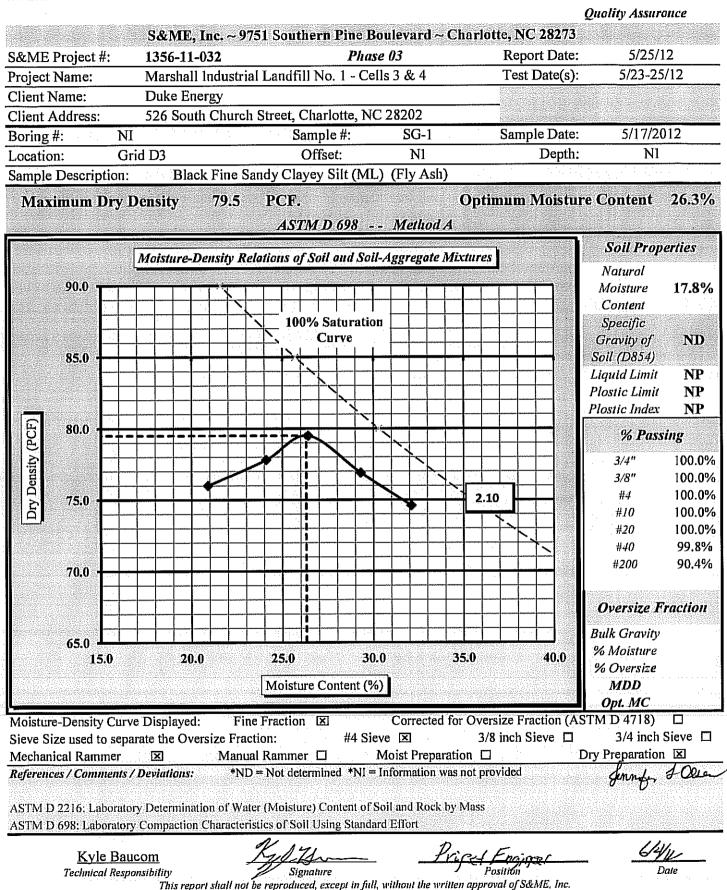
### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report





Revision Dote: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project #: 13	356-11 <b>-032</b>	arramenta sa menerana ariba sa ariba s	Phase	<i>03</i>	Report D	)ate:	5/25/12
j	[arshall Industria	Landfill No.	1 - Cells 3 &	. 4	Test Dat	te(s)	5/23-25/12
-	uke Energy						
	26 South Church	Street, Charlo	tte, NC 2820	2			
Boring#: N	I II MALA	Sa	mple #:	SG-1	Sample D	Date:	5/17/2012
	rid D3	C	)ffset:	N1	De	pth:	NI
Sample Description:	Black Fir	e Sandy Clay					
Type and Specification	ı S&METL			e and Specificati	CONTRACTOR OF THE PROPERTY OF	ME ID#	Cal Date:
Balance (0.1 g)	22182	Control of the Contro	62362781NG checkbook habit bilden crystroey	npaction Mold		20231	1/6/2012
Balance	22182	And A Torontal South South Strategy and Annual Control of the Cont	ROSE ENDINANTION CONTRACTOR OF THE WATER OF	paction Hamme	A THE PARTY OF THE	20222	6/6/2011
Straightedge	20124		2012 Ove	n		11072	3/23/2012
Sieve #4	10939		MAC II 2017 A CONTRACTOR OF THE PARTY OF THE		nrev.	Check:	
Water Content			iP Z Balance ((	).1 gram Readab ASTM D4959			1 D4643 □
ASTM D2216 ☑	Water Added:	TO T265 □ 150	200	100	ت 50	250	
	Water Added. Tare #:	AMRL	JLG	GH	99	695	
A Tone Weight	A.	163.5	162.8	164.1	157.9	161.1	
A. Tare Weight B. Wet Wt + Tare V	£5550 254-34350 62255 6355	1123.6	925.1	1187.8	1002.8	1241.9	
	Strips to open comments of the	923.0	752.3	989.1	857.8	978.2	
C. Dry Wt. + Tare V	Found to the child of the charter or make			198.7	145.0	263.7	
D. Water Weight	B-C	200.6	172.8				
E. Dry Weight	C-A	759.5	589.5	825.0	699.9	817.1	
F. Moistnre Conte	. Jacobsky of Anthony Challes of Anthony Company	26.4%	29.3%	24.1%	20.7%	32.3%	
Compaction Data			PARTY OF THE STATE	gram or .0022 Li		Check:	CTUTO TUBO
ASTM D558 □ Method A ⊠	ASTM D 698 Method B		TM D1557 □   C □	AASHTO	T99 □ STM 1978) □		SHTO T180 TTO Method D
G. Wt of Soil + Mol	en manus Contra personal di constituitata	5756	5739	5698	5628	5732	
H. Wt. of Mold	H.	4241	4241	4241	4241	4241	
The first of the first property of the first	9/0/25/25/25/25/25/25/25/25/25/25/25/25/25/	1515	1498	1457	1387	1491	
I. Wt. of Soil (g. or	lbs.) G-H 1/453.6 or 1		3.302	3.212	3.058	3.287	
J. Wt of Soil (Lbs.)	CORPORATE AND	3.340		30.09	30.09	30.09	
K. Mold Volume Fa	Francisco de Companyo de Compa	30.09	30.09		· · · · · · · · · · · · · · · · · · ·		
L. Wet Density (PCF	- Chicken Control of the Control	100.5	99.4	96.6	92.0	98.9	
M. Dry Density (PC	1,00,00,00,000,000,000	79.5	76.9	77.8	76.2	74.8	3/4 inch Sieve
Sieve Size used to separa Mechanical Rammer	eladourelisa in electricia da eligibilità e vicilità e Fu	Alfred Maria Arra, Large and Arriva Array and a	#4 Siev	e ⊠ Moist Prepa	3/8 inch Sieve ıration □	经收益 经直接收益 化电子电阻 电电流电池	eparation
References / Comments		*ND = Not dete	rmined *NI = Ir	formation was not	t provided		

Jennifer Olsen

Technician Name

Technical Responsibility

NICET/117926 Certification Type/No. 5/25/2012 Date

Kyle Baucom

Signature

Position

Date

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## Farm No. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

Particle Size Analysis of Soils ASTM D 422

**S&ME** 

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

	i Wt.	40000	) Fan# 100.0%		) 100.0%		Set Montage		100.0%	0.00% 100.0%	%8.66 %6.66 I	t 99.3% 99.2%		7 90.5% 90.4%	Weathered & Friable	osphate: 40 g/Liter	Cal. Date;	152H	tive   Taking   Diameter	Tanico	$\mathbf{K} = [\mathbf{K} \times (\mathbf{LT})^{12}]$	0.01584	0.01584	0.01584	.8 0.01584 0.01517	0.01584	0.01584	0.01584	.0 0.01584 0.00167		
	Sieve Retained Wt.	3.0" 0.0	0.0	T:0" 0.0	3/4" 0.0	1/2" 0.0	0.0 "8/8"	0.0 #4 0.0	#10 0.1	0.0 0.0	#40 0.1	#60 0.4	#100 1.2		Soft 🗅 Weath	Sodium Hexametaphosphate:	7g Car		g Effective	(total) = Depth	P x % Passing #10   L	6.6 %0.78	70.3% 11.1	56.9% 12.1	34.6% 13.8	23.4% 14.6	16.7% 15.1	7.8% 15.7	3,3% 16.0		
estationisessissioniseussensissioniseussensissioniseussensissioniseussensissioniseussensissioniseussensissioni 711173	o/1/12 arlotte, NC 28202	te: 5/17/12	n: NI		Assumed) 2.100		Hygroscopic   Natural	W	15.99 86.43	27.48 301.48	27.42 268.92	0.06 32.56	11.43 182.49	0.52% 17.8%		me: 1 min.	ır. D.No.	Type: 151H	Percent Passin	P(#10) = P(total) =	xa/W)x100	87.0%	70.3%	56.9%	34.6%	23.4%	16.7%	7.8%	3.3%		
9 - 1	1est Date(s): 5/21/12-0/1/12 526 S. Church St. Charlotte, NC 28202	Sample Date:	Elevation:		Apparent Relative Density (Assumed)		Moisture Conteat Hy			Wet Wt. + A	Dry Wt. + A	Ç	(C-A)	00 x D/E)	Hard & Durable	Dispersion Time:	Hydrometer:		Electronic State Company of the Comp	Hydrometer —	i ka	39.00	31.50	25.50	15.50	10.50	7.50	3.50	1.50		
ONE DATABATI	- Cells 3&4 Lest Address: 53	SG-1	IZ	ML) (Fly Ash)		50 (00 (00 (0)			98 A	B	Đ	D W	ш		1 Angular		oate: 6/22/2011		Corrections	Control Composite		200	4.5	4.5	4.5	4.5	4.5	4.5	4.5	7. D 4318	AN TABLE SPECIAL STREET AND STREET ST
ise 03	al Landfull No. 1 -	Sample #:	Offset:	Samule Description: Black Fine Sandy Clavey Silt (ML)	Beaker #: 8		00.0	C		ole (g): 50.00	261.61				s Rounded 🗆	N N	3222 <i>Cal. Date.</i>	Composite Correction	STORY OF THE STORY	Hydrometer —	Reading		36.0	30.0	20.0	15.0	12.0	8.0	0.9	ASTM D 422 D 2487. D 4318	
1356-11-132 Phase 03	Marshall Industrial Landfull No. 1 Duke Energy	NI NI	Grid D3	ion: Black Fine S	8		grams):	Total Sample Air Dried Wt. + tare wt. (grams):	ample Air Dried:	Weight of Air Dried Hydrometer Sample (g):	n Dried:	le Oven Dried (W):	1	a (Table 1):	Description of Sand & Gravel Particles	ratus: A I	No.	der 🗵		Temp.	(0,50)	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	wnts / Davintions	Constitution of the Consti
Project #:	Project Name:	.   '	Location:	Sample Descript	Pan #:	Hvdrometer Jar#:	Pan Tare Weight (grams):	Total Sample Air I	Weight of Total Sample Air Dried:	Weight of Air Drie	Total Sample Oven Dried:	Hydrometer Sample Oven Dried	% Passing #10:	Correction Factor a (Table 1):	Description of San	Stirring Apparatus:	Balance:	Control Cylinder		Time	T (Min)		2	5	15	30	09	250	1440	Rafarances / Comments / Devittions	Section of the sectio

3201 Spring Forest Rood Roleigh, N.C. 27616

1356-11-032 Phase 03 SG-1 Hydro.xlsx Page 1 of 1

Karen Warner Teclinician Name

Technical Responsibility

Certification # 117900

Kyle Baucom

Revision No. 0

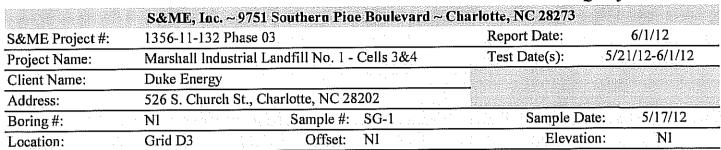
Revision Date: 02/20/08

### Particle Size Analysis of Soils

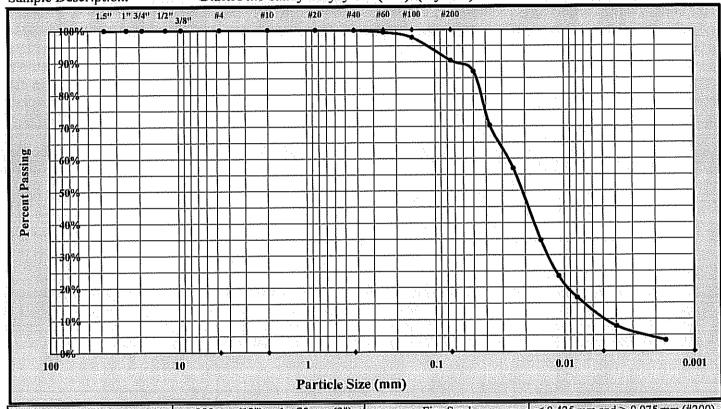


ASTM D422

Quality Assurance



Sample Description: Black Fine Sandy Clayey Silt (ML) (Fly Ash)



Control of the contro		······································	
Cobbles	<300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay.	< 0,005 mm
Medium Sand	<2,00 mm and > 0,425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	80.2%
Silt & Clay (% Passing #200):	90.4%	Total Sand:	9.6%	Clay	10.3%
ent Relative Density (Assumed)	2.100	Moisture Content	17.8%	Colloids	and Applied Applied and the second applied applied and the second applied applied and the second applied app
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	9.4%
Description of Sand and Gravel	Rounded 🗆	Angular □ Hard & 1	Durable 🗆	Soft   Weathered &	Friable 🗆
Mechanical Stirring Apparatus A	Dispersion Pe	riod: 1 min. Dispersin	g Agent: Soc	lium Hexametaphosphate:	40 g./ Liter
References / Comments / Deviotions:	ASTM D	4318, D 2487 N1 = Informatio	n not provided, l	ND = Not determined.	
Technician Name: Karen W	arner		D	ate: 6/1/12	

Kyle Baucom

Technical Responsibility

Project Engineer

Date

This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Client code

Client Test #

state#

**♦S&ME** 

Revision No. 0

### Liquid Limit, Plastic Limit, and Plastic Index

Assim D 4318	Revision I	Date: 11/2	0/07 Liqu	la. Tili	iii, Fiastic L	лши, аі	114 1 14	istic in	UCA	*	2 - 4 2 1 4 4 4 1		
Project #: 1356-11-032	Another c	ode	ASTM D 4318	×	AASHTO T 89		AASH	TO T 90		Qual	ity Assure	ınce	
Project Name:   Marshall Industrial Landfill No. 1 - Cells 3 & 4			S&ME, Inc.	~9751	Southern Pin	e Bouley	ard,Cl	arlotte.	NC 282	73			
Project Name:   Duke Energy	Project	<b>#:</b>	1356-11-032	eronantendamento antica	PI	ase 03	hdgen, in ; ing ), n y Digenstell Jugade in e	55-14-C-17-C-17-C-17-C-17-C-17-C-17-C-17-C	Report I	)ate:	6/1/12	2	
Client Name:   Duke Energy   Client Address:   528 South Church Street, Charlotte, NC 28202			Marshall Industrial	Landfi	II No. 1 - Cells	3&4			Test Da	te(s) 5	5/18/12-6/1/12		
Client Address: \$26 South Church Street, Charlotte, NC 28202			Duke Energy				•	. 98					
Location:   Grid D3	Client A			Street,	Charlotte, NC 2	28202							
Decation:   Grid D3	Boring#	: N1		Sam	ple #: SG-1			Samp	le Date:	5/17/12			
Type and Specification   S&ME ID #   Cal-Date:   Type and Specification   Cal-Date:			D3	О	ffset: NI			E	levation:	NI			
Type and Specification   S&ME ID #   Cal-Date:   Type and Specification   Cal-Date:	Sample I	Descriptio	n: Black Fin	e Sand	y Clayey Silt (N	ML) (Fly	Ash)						
District Cartests   Constitution				#	Cal Date:	Type and	Specifi	cation					
Does	Balance (	(0.01 g)	3222		And the State of t	mental distribution and set stempts	- Transport of the Control of the Co			20165	12/20	/2011	
Tare #:	P. A.C. Color Del Color	atus	CALLE CONTRACTOR AND AND AND ADDRESS OF THE WAS CONTRACTOR OF THE		PTIVATED SETTLE CONTRACTOR OF THE PARTY OF T	Niuliannia, altitute errority and a series	The state of the s						
Tare ##			10844		5/9/2012		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				niasua tilasi		
A   Tare Weight   B   Wet Soil Weight + A   C   Dry Soil Weight + A   C   Dry Soil Weight + A   C   Dry Soil Weight (B-C)   C   C   C   C   C   C   C   C   C	Pan#		Tore#•			Fidnia Fiwi	ι - Ι				FIRSUC LIIIII		
B Wet Soil Weight + A C Dry Soil Weight (B-C) E Dry Soil Weight (C-A) F % Moisture (D/E)*100 N # OF DROPS LL LE F * FACTOR Ave: Average  One Point Liquid Limit N Factor N Factor N Factor 20 0.974 26 1.005 21 0.979 27 1.009 22 0.985 28 1.014 45.0 40.0 40.0 40.0 40.0 40.0 40.0 40.0	A	п											
C											n e jek	1 % 4	
D   Water Weight (B-C)   E   Dry Soil Weight (C-A)   F   % Moisture (D/E)*100   Moisture (D/E)*100   Moisture Contents determined by ASTM D 2216   Moisture Co													
E Dry Soil Weight (C-A)  F % Moisture (D/E)*100  N # OF DROPS  LL LL = F * FACTOR  Ave. Average   One Point Liquid Limit  N Factor N Factor  20 0.974 26 1.005  21 0.979 27 1.009  22 0.985 28 1.014  45.0 20 0.985 28 1.014  45.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0									116				
F   % Moisture (D/E)*100   Moisture Cantents determined by ASTM D 2216												<u> </u>	
N				<u> </u>									
Lil				-									
Ave.   Average   Constitution   Co	A Comment of the Court States of the Court												
Cone Point Liquid Limit   N   Factor   N   Factor   20   0.974   26   1.005   21   0.979   27   1.009   22   0.985   28   1.014   23   0.99   29   1.018   24   0.995   30   1.022   25   1.000   NP, Non-Plastic   Liquid Limit   Plastic L	ALCOHOLOGICA STANDARD STANDARD	200000000000000000000000000000000000000		(GPHL251) (FPHL26)									
N   Factor   N   Factor	Ave.		Ayeruge							One Point L	iauid Limit		
21    0.979   27    1.009   22    0.985   28    1.014   23    0.99   29    1.018   24    0.995   30    1.022   25    1.000   NP, Non-Plastic   Liquid Limit   Plastic Limit	6	S.0							N	·		Factor	
22	6	0.0							20	0.974	26	1.005	
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils   Jennifer Olsen   Jen	T 5	S.0											
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils   Jennifer Olsen   Jen	ren s	30.0											
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils   Jennifer Olsen   Jen		::											
Plastic Limit Plastic Index Group Symbol ML  Multipoint Method One-point Method One-point Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.	e   4										30	1.022	
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Plastic Limit Plastic Index Group Symbol ML  Multipoint Method One-point Method One-point Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.  Myltipoint Method  Notes / Deviations / References:  NI = Information not provided.	<b>ĕ</b>    3	55.0								A CONTRACTOR OF THE PARTY OF TH	NAMES OF TAXABLE PARTY OF THE PARTY OF TAXABLE PARTY.		
Plastic Index Group Symbol ML  Multipoint Method One-point Method One-point Method  Notes / Deviations / References:  NI = Information not provided.  MSTM D 4318: Liquid Limit, Plastic Limit, & Plostic Index of Soils  Jennifer Olsen Technician Name  Plastic Index Group Symbol ML  Multipoint Method One-point Method  Sieve:  Kyle Baucom Technical Responsibility Date	<u> </u>	0.0											
Comp Symbol ML   Group Symbol ML   Multipoint Method   One-point Method   One-point Method   One-point Method   One-point Method   Notes / Deviations / References:   NI = Information not provided.   Symbol ML   Multipoint Method   One-point Method   One-	,	.5.n									\$\$\$\$\$\$\$\$EF	24070000 2403000	
Multipoint Method   Wet Preparation   Dry Preparation   Air Dried   Estimate the % Retained on the #40 Sieve:   Notes / Deviations / References:   NI = Information not provided.										i breversaus saasabiis	1935-000		
Wet Preparation Dry Preparation Air Dried Estimate the % Retained on the #40 Sieve:  Notes / Deviations / References: NI = Information not provided.  ASTM D 4318: Liquid Limit, Plastic Limit, & Plostic Index of Soils  Jennifer Olsen January 1044 6/1/2012 Kyle Baucom Technician Name  Technician Responsibility Date		and the second second	15 70	75 30	35 40	4 (D		100					
Wet Preparation Dry Preparation Air Dried Estimate the % Retained on the #40 Sieve:  Notes / Deviations / References: NI = Information not provided.  ASTMD 4318: Liquid Limit, Plastic Limit, & Plostic Index of Soils  Jennifer Olsen January 1 One 6/1/2012 Kyle Baucom Technician Name  Responsibility Date			20	20	70	H of Drop	S				1.5 4 4		
Notes / Deviations / References: NI = Information not provided.  ASTM D 4318: Liquid Limit, Plastic Limit, & Plostic Index of Soils  Jennifer Olsen Jennifer Olsen Technician Name  Date  Technician Responsibility  NI = Information not provided.  Kyle Baucom Technician Responsibility Date				- T.	a sala Ata Data J	W 7	F	ada dha 0/				<u>L.J.</u>	
ASTM D 4318: Liquid Limit, Plastic Limit, & Plostic Index of Soils  Jennifer Olsen from LOur 6/1/2012 Kyle Baucom Technician Name Date Technical Responsibility Date		•				<del></del>	Estime	ule ine 26 l	кештей о	n the #40 St	eve.		
Jennifer Olsen Jame LOue 6/1/2012 Kyle Baucom Technician Name Date Technical Responsibility Date	Notes / De	eviations / R	ejerences: 141 –	IIIIOIIIIa	tion not provide	u. :	<u> </u>		<u> </u>				
Jennifer Olsen Jame LOue 6/1/2012 Kyle Baucom Technician Name Date Technical Responsibility Date		- Marian			· - 1 1.3	. :				1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			
Technician Name Date Technical Responsibility Date	ASTM D	4318: Liqu	ud Limit, Plastic Lim	it, & Pla	stic Index of Soi	ls							
Technician Name Date Technical Responsibility Date			0 :								/1	11.	
1 common Tune				20se	√ <u>6/1/2012</u>						6/4	<u>t//2_</u>	
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Raleigh, NC. 27616

Form No: TR-D2216-T265-1

Revision No. 0

Revision Date: 02/22/08

### **Laboratory Determination of Water Content**



* * ***			A	STM D 221	6 🗸	AASHTO T 20	55 🗌	Qual	ity Assurance		
		•	&ME, Inc.	~ 9751 S	outhern Pine	Bouleyard≈	Charlotte, N	C 28273			
Project	#:	1356-	11-032	ermoning common managed by a good of Control	Pi	iase 03	Report D	ate:	5/25/12	- <del> </del>	
Project N	Vame:	Marsl	all Industria	ıl Landfill	No. 1 - Cells	3&4	Test Date(s): 5/21-25/12				
Client N			Energy				Benefit of the control of the contro				
Client A				Street, Cl	narlotte, NC 2	28202	See and the second control of the second con				
Sample l	-		y Addis	<u> </u>	<u> </u>		Sample Date	<del>``</del>	5/17/12	V .	
	g Method		NI				Drill F 3222		NI		
	od: /			B (0.1%	6) L	Balance ID		Calibration De			
Boring No.	Sampi No.	tations are and	Sample Depth	Tare#	Tare Weight	Tare Wt#= Wet Wt	Tare Wt.+ Doy Wt	Water Weight	Percent Moisture	o	
			n. or m.		grams	grams	grams	grams	96	e	
	SG-1			AL	86.43	301.48	268.92	32.56	17.8%		
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Notes / De	vintions / R	eferenc	es		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			to the engineer	. 1	- A TANKE TO A TANKE	
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ASTMID	22 6: 1 ab	oratory	aDeterminatio	on of Water	(Moisture) Co	ontent of Soil and	d Rock by Mas				
		4 4 4 7 9	Amerika tari	P	1 1 N	01.		* MATERIAL COLUMN   * * * * * * * * * * * * * * * * * *			
	Jennife Technici		<u>n</u>	Gens	Signature	yen)	NICET / 117 <sup>s</sup> Certification Type		<u>5/25/2012</u> Date	2	
	<u>Kyle B</u> Technical Re			Lyl	M. M.	- Pro	nt Engineer	I	5/29/12		
	reconicai Re	esponsio:		Il nest ha wasse-	Signature	ill without the weit	FOSITION	MF Inc	Date		

Form No: TR-D2216-T265-1

Revision No. 0

Revision Date: 02/22/08

### **Laboratory Determination of Water Content**



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Dualast	<b>4.</b> 1	S&ME, Inc 356-11-032 Ph		Southern Pine	Boulevard ~			C/00/10		
Project N		1arshall Industria		IN 1 Calle 2	0. 1	Report I		6/22/12		
Client N		uke Energy	at Lanum	i No.1-Cells 3	<del>~4</del>	Test Dat	e(s):	6/20-22/12		
Client A	<u> </u>	26 South Church	Street C	harlotta NC 3	28202				42-14 A	
Sample l		mmy Addis	i Sircoi, C	marione, IVC 2	20202	Sample Dat	e(s)·	6/4/12		
	g Method:	ining rudus				Drill		0/4/12		
Metho	CONTRACTOR OF THE PARTY OF THE	1%)	B (0.19	%)	Balance ID.	3222	Calibration D	ate: 6/23/	77	
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N	
		ft. or m.		grams	grams	grams	grams	%	↓ t le	
NA	SG-2	NA	Jazz	81.37	370.08	326,44	43.64	17.8%		
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Notes / De	viations / Refe	erences								
	perature Set									
Location.	Glid C3	· · · · · · · · · · · · · · · · · · ·								
ASTM D	2216: Labor	atory Determination	on of Wate	r (Moisture) Co	ntent of Soil an	d Rock by Mas	S		districtions	
	Karen W	arner	SA	Marie Signature	ux	NICET 1179 Certification Type	9 <u>00</u>	6/22/201 Date	2	
	Kyly Bat Technical Resp	onsibility	Key	Signature oduced, except in fi		Project Engin		<u>6/22/)2</u> Date	<u>**                                    </u>	

### Form Na. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

Particle Size Analysis of Soils



ASTM D 422

Project#:	1356-11-032 Phase 03		S&ME, Inc. ~975		Southern Pine Boulevard ~ Charlotte, NC 28273 Report Date: 6/27/12	ard ~ Charlo 12	Ite, NC 282	73			
Project Name:	Mashall Industrial Landfill No.1 - Cells 3&4	ial Landfill N	o.1 - Cells 3&		Test Date(s): 6/20-27/12	27/12					
Client Name:	Duke Energy		A	Address: 526	526 S. Church Street, Charlotte, NC 28202	et, Charlotte,	NC 28202	Sieve	Retained Wt	Percent Passing	assing
Boring #:	NA	Sar	Sample #: SG-2	-2	Sample Date:		6/4/12	3.0"	0.0		100.0%
Location:	Grid C3		Offset: NA		Elevation:	tion:	NA	1.5.1	0.0	Fan#	100.0%
Sample Description:	tion: Black Gray Silt (ML.	Silt (ML)	Fly Ash	sh				1.0°L	0.0	(wasned)	100.0%
Pan #:		Beaker#:		Apparent	Apparent Relative Density (Assumed)	/ (Assumed)	2.200	3/4"	0.0		100.0%
Hydrometer Jar #:								1/2"	0.0		100.0%
Pan Tare Weight (grams):	(grams):	Contraction (Contraction Contraction Contr		Moistur	Moisture Content	Hygroscopic	Natural	3/8"	0.0		100.0%
Total Sample Air	Total Sample Air Dried Wt. + tare wt. (grams):	. (grams):	309.25		Tare #	X	Jazz	7#	0.0	Soll Mortar	100.0%
Weight of Total Sample Air Dried:	ample Air Dried:	A.A.	309.25	T T	Tare Wt.	16.06	81.37	0T#	0.1	100:0%	100.0%
Weight of Air Dri	Weight of Air Dried Hydrometer Sample (g):	nple (g):	50.00	B We	Wet Wt. + A	27.76	370.08	#20	0.0	%6.66	%6.66
Total Sample Oven Dried:	n Dried:		308.72	™ ©   Dry	Dry Wt. + A	27.74	326.44	#40	0.1	%6.66	%8.66
Hydrometer Sample Oven Dried	ole Oven Dried (W):	· · · · · · · · · · · · · · · · · · ·	49.91	D Water	Water Wt. (B-C)	0.02	43.64	09#	0.2	99.5%	99.5%
% Passing #10:		e de la composition della comp	100.0%	E Dry V	Dry Wt. (C-A)	11.68	245.07	#100	1.2	97.7%	97.7%
Correction Factor a (Table 1):	a (Table 1):	1137	1.09	% Moisture	% Moisture (100 x D/E)	0.17%	17.8%	#200	4.9	90.2%	90.2%
Description of Sa	Description of Sand & Gravel Particles	ss Rounded		Angular D	E Hard & Durable	urable 🗵	Soft		Weathered & Friable	Friable 🗀	
Stirring Apparatus:	aratus: A	M M			Dispersion Time:	ı Time: 1 min.		odium Hexa	Sodium Hexametaphosphate	e: 40 g./Liter	
Balonce:	DNø.	3222	Cal. Date:	6/25/2012	Hydrometer	ieter; D.No.		3901	Cal. Date:	3/25/2012	
Control Cylinder	der 🗵	Composite Correction				Type:	151H		152H	×	
	Manual Campus	Liverometer		Corrections	Lingsometer		Percent Passing		Effective	Tallan	Diameter
DITT	.temp.			Composite	nyarometer	P(#10)=		[a] =	Depth	Table 3	
T (Min.)	(0.5°C)	Reading	Cylinder	Correction	R	$(\mathbf{R} \times \mathbf{a} / \mathbf{W}) \times 100$		Px%Passing#10	L	K	$\mathbf{K}_{\mathbf{X}}((\mathbf{L}/\mathbf{D})^{1/2})$
-	21.5	45.0	5.0		40:00	87.3%	87.	87.3%	2.6	0.01571	0.04903
. 2	21.5	39.0	5.0		34.00	74.2%	74.	74.2%	10.7	0.01571	0.03638
<b>5</b>	21.5	29.0	5.0		24.00	52.4%	52.	52.4%	12.4	0.01571	0.02470
15	21.5	16.5	2.0		11.50	25.1%	25.	25.1%	14.4	0.01571	0.01540
30	21.5	13.0	2.0		8.00	17.5%	17.	17.5%	15.0	0.01571	0.01110
09	21.5	10.0	5.0		5.00	10.9%	.01	10.9%	15.5	0.01571	0.00798
250	21.0	8:0	2.0		3.00	6.6%	6.5	6.5%	15.8	0.01581	0.00397
1440	23.0	5.5	4.5		1.00	2.2%	2.2	2.2%	16.1	0.01544	0.00163
References / Camments / Deviations	ents / Deviations	ASTM D 422	ASTM D 422, D 2487, D 4318								
						A CONTRACTOR OF THE PROPERTY O			The state of the s	CONTRACTOR	A Charles of the Control of States and Artist And Charles of States and Artist And Artis

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kvle Baucom

NICET 117900 Certification #

Karen Warner Teclinician Name

Position

1356-11-032 Phase 03 SG-2 Hydro xls Poge 1 of 1

Project Engineer

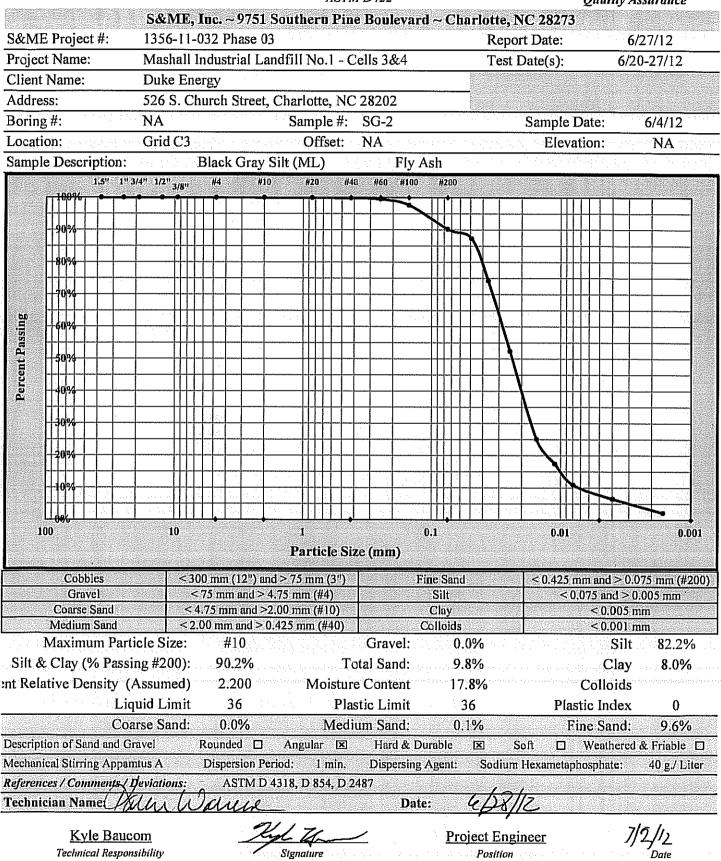
Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance



### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

a de la companya de	&ME, Inc.	~ 9751 Soutl	hern Pine Bou	ilevard~Cha	rlotte, NC 282	.7 <b>3</b>		
Project #: 1356-1	1-032		Phase	03	Report D	Date:	6/25/12	
		l Landfill No.	1 - Cells 3 &	4	Test Da	te(s)	5/21-25/12	
Client Name: Duke E	<u> </u>							
Client Address: 526 So	uth Church	Street, Charle	otte, NC 28202	<b>!</b>				
Boring #: NA			mple #:		Sample D	Pate:	6/4/2012	
Location: Grid C					De	pth:	NA	
Sample Description:		, ,						
Type and Specification		)# Cal 1		and Specificat		ME ID#	Cal Date:	
Balance (0.1 g)	22182	CANADA CHIPCA CONCUPRIOR BUILDING CALLED CHILDREN	A SALAMAN AND A	paction Mold	ACOMEN, CARST MACCHETT CLOCKING CONTRACT CONTRAC	20231	1/6/2012	
Balance	22182			paction Hamm	mand is have also with the Also be selected to the control of the selection of the selectio	20222	6/6/2012	
Straightedge Sieve	20179 22100	mmh.zm542m244.0640.6445.000344/214407846.274407209	/2012 Over			1072	3/23/2012	
	G 1/10-0-14/10-0-14/10-0-10-0-10-0-10-0-10	W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-000-W-	2012 P 2 Balance (0.	l orom Daadab	HILA	Check:		
ASTM D2216 ⊠		nent requires € TO T265 □		ASTM D4959			D4643 □	
WWW.	ter Added:	600	650	550	500	450	D4043	
	Tare #:	18	AMRL 148	SR	JDM	MAC	Marie Province School Section (1997)	
A. Tare Weight	Α,	157.4	160.6	163.6	159.2	161.6		
B. Wet Wt + Tare Wt	В.	976.3	1060.4	1056.4	985.5	904.7		
C. Dry Wt. + Tare Wt.	C.	788.0	840.1	863.7	818.0	765.9		
D. Water Weight	B-C	188.3	220.3	192.7	167.5	138.8		
E. Dry Weight C-A 630.6 679.5 700.1 658.8 604.3								
F. Moisture Content	100*D/E	29.9%	32.4%	27.5%	25.4%	23.0%		
Compaction Data	Requires a	GP 5 Balance	for ASTM (1 g	am or .0022 L	b. readability).	Check:		
	ASTM D 698		TM D1557 🗆	AASHTO		AAS	HTO T180 🗆	
Method A ⊠	Method B	A CONTRACTOR OF THE CONTRACTOR	WWW. C.		TM 1978) □		TO Method D 🖂	
G. Wt of Soil + Mold	G,	5731	5705	5723	5673	5615	The Committee of the Co	
H. Wt. of Mold	H.	4242	4242	4242	4242	4242		
1. Wt. of Soil (g. or lbs.)	G-H	1489	1463	1481	1431	1373		
J. Wt of Soil (Lbs.)	453.6 or I	3.283	3.225	3.265	3.155	3.027		
K. Mold Volume Factor	Κ,	30.09	30.09	30.09	30.09	30.09		
L. Wet Density (PCF)	J*K	98.8	97.0	98.2	94.9	91.1		
M. Dry Density (PCF)	L/(1+F)	76.1	73.3	77.0	75.7	74.1		
Sieve Size used to separate the (			#4 Sieve		3/8 inch Sieve		3/4 inch Sieve □	
Mechanical Rammer 🗵	Manual F	And the state of the Sea Control	The second control of	Moist Prepa	12-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	Dry Pre	paration 区	
References / Comments / Devia	tions:	NI = Intormation	not provided. NI	) = Not determin	ned.			
					<u> </u>	<u> </u>		
					<u> </u>			
Jennifer Olsen		donnel	1 Open	NIC	CET / 117926		6/25/2012	

Kyle Baucom Technical Responsibility

Technician Name

NICET / 117926 Certification Type/No.

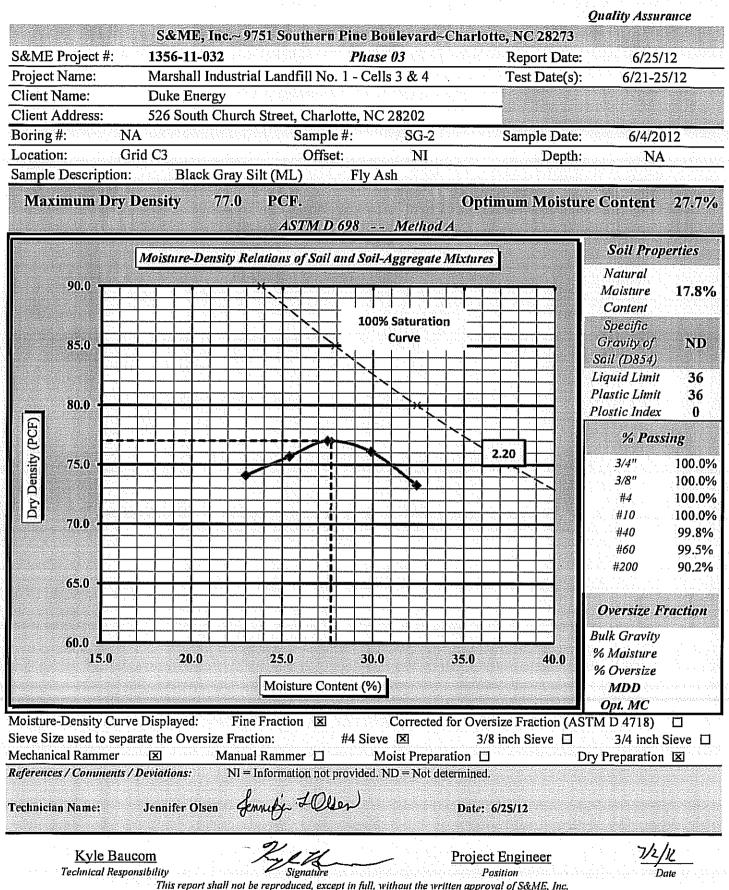
6/25/2012 Date

Project Engineer Position

Revision Dote: 11/21/07

### Moisture - Density Report





Revisian Na. 0

### Liquid Limit, Plastic Limit, and Plastic Index



Revisian Dote: 11/20/07 Another code ASTM D 4318 X AASHTO T 89 П AASHTO T 90 **Onality Assurance** S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Project #: 1356-11-032 Phase 03 Report Date: 6/28/12 Marshall Industrial Landfill No.1 - Cells 3&4 Project Name: Test Date(s) 6/20-28/12 Client Name: Duke Energy Client Address: 526 South Church Street, Charlotte, NC 28202 Boring #: NA Sample #: SG-2 Sample Date: 6/4/12 Grid C3 Location: Offset: Elevation: NA Sample Description: Black Gray Silt (ML) Fly Ash Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 3222 6/25/2012 Grooving tool 20165 12/20/2012 LL Apparatus 20230 6/26/2012 Grooving tool 10844 Oven 5/9/2012 Grooving tool Liquid Limit Pan# Piastic Limit Tare #: П RR 34 P-6 P-1 Tare Weight 16.90 15.28 14.98 12.55 12.58 Α Wet Soil Weight + A В 27.95 26.98 23.41 18.86 19.45 Dry Soil Weight + A 25.11 23.81 C 20.93 17.19 17.63 D Water Weight (B-C) 2.84 3.17 2.48 1.67 1.82 E Dry Soil Weight (C-A) 8.21 8.53 5.95 4.64 5.05 F % Moisture (D/E)\*100 34.6% 37.2% 41.7% 36.0% 36.0% N # OF DROPS 27 22 17 Moisture Contents determined LL LL = F \* FACTOR by ASTM D 2216 Ave. Average 36.0% One Point Liquid Limit 50.0 N Factor N Factor 20 0.974 26 1.005 45.0 21 0.979 27 1.009 % Moisture Content 22 0.985 28 1.014 23 0.99 29 1.018 40.0 24 0.995 30 1.022 1.000 25 35.0 NP, Non-Plastic Liquid Limit 36 30.0 Plastic Limit 36 Plastic Index 25.0 Group Symbol ML 10 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method 7 ग Wet Preparation **Dry Preparation** Air Dried Estimate the % Retained on the #40 Sieve: Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name

6/28/2012

Kyle Baucom Technical Responsibility

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Kevision .	Date: 02/22/		1STM D 22	16 🗸	AASHTO T 2	965 D	One	ility Assurance	
	The state of the s		THE THE PARTY OF T	Southern Pine				my monute	
Project	#• 1	356-11-032	Comment I control of the matter and control of the matter	264642000000000000000000000000000000000	1ase 03	Report I		8/7/12	
Project 1		Aarshall Industri	ial Landfil			Test Dat		8/3-7/12	
Client N		uke Energy				2 7 1 4 2 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
Client A		26 South Churc	h Street, C	Charlotte, NC 2	28202	1			
Sample l	by: J	immy Addis				Sample Dat	e(s):	7/25/12	
	g Method:	NI		3.5.19.20.13.2.2012. 25.40.00.0.0.20		Drill I		NI	
Metho	od: A	(1%)	B (0.1	%) 🛛	Balance ID.	3222	Calibration L	ate: 6/25/J	
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. +- Dry-Wt	Water Weight	Percent Moistare	N o t
		ft. or m		grains	grams	grams	grams	%	e
	SG-3		STAR	16.39	454.86	398.46	56.40	14.8%	
									70 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -
	SG-4		301	16.35	654.21	566.31	87.90	16.0%	
									TOTAL
									The second secon
									11-22-11-2
									/
									10, 10, 10, 10, 10, 10, 10, 10, 10, 10,
									ATT STATE OF THE S
Notes / De	viations / Ref	erences NI	= No infor	nation provided				**************************************	
Was no b	aggie or jar,	s <b>o</b> moisture samp	le was take	n from the botto	om of the bucke	t.			
							· · ·		
ASTM D	2216: Labo	atory Determinat	ion of Wate	er (Moisture) Co	ontent of Soil a	id Rock by Mas	ss in the little plant is the		A
	Jennifer Technician		<u> </u>	nnufx ±00 Signame	Lew .	NICET / 117 Certification Type		<u>8/7/2012</u> Date	2
	Kyle Ba Technical Resp		Thy	C I Signature		reject Engin	21/	<u> 2/15/12</u> Dane	,
		This vanous als	all not ha row	roducad arcont in	full without the year	itton approval of C.	&ME Inc		

Raleigh, NC. 27616

## Particle Size Analysis of Soils

**SEMINE** 

Revision Date: 02/20/08

Revision No. 0

ASTM D 422

# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

											are Set at 60C.	Oven Temperature Set at 60C
								18	D 2487, D 43	ASTM D 422, D 2487, D 4318	nents / Devintions	References / Comments / Devintions
0.00167	0.01571	16.2	1.1%	1.1	1.19%	0.50			5.0	シュン	21.5	1440
0.00397	0.01571	16.0	1%	4.4%	4,4%	2.00			5.0	7.0	21.5	250
0.00796	0.01571	15.4	2.0%	12.	12.0%	5.50			5.0	10.5	21.5	60
0.01110	0.01571	15.0	17.5%	17.	17.5%	8.00		41.5 41.5	5.0	13.0	21.5	30
0.01522	0.01571	14.1	5%	29.5%	29.5%	13.50			5.0	18.5	21.5	15
0.02421	0.01571	6.11	10%	59.1%	59.1%	27.00		Carlo	5.0	32.0	21.5	5
0.03624	0.01571	10.6	75.5%	75.	75.5%	34.50			5.0	39.5	21.5	2
0.05005	0.01571	10.1	0%	82.0%	82.1%	37.50			5.0	42.5	21.5	1
K x ((L/T) <sup>1/2</sup>	к	L	ssing #10	Px	(R x a / W) x 100	R	Correction		Cylinder	Reading	(0.5 °C)	T (Min.)
Diameter D =	Table 3	Effective Depth	<u>al) =                                   </u>	Percent Passing ) = P(total) =	P(-#10) =	Hydrometer	ons Composite	Corrections of Con	Control	Hydrometer	Temp.	Time
	×	152H		151H	Type:	The state of the s			orrection	Composite Correction	lder 🗵	Control Cylinder
2	3/25/2012	Cal. Date:		3901	meter: ID No.	Hydrometer:	6/25/2012	6/2	Cal. Date:	3222		Balance:
er	Sodium Hexametaphosphate: 40 g./ Liter	ametaphosphai	dium Hexa		ın Time: 1 min.	Dispersion Time:				X B	A	Stirring Apparatus:
	c Friable □□	Weathered & Friable		Soft	Durable 🗵	Hard & Durable	ılar X	Angular		s Rounded	Description of Sand & Gravel Particles	Description of Sa
91.0%	91.0%	4.46	#200	14.8%	0.38%	% Moisture (100 x D/E)	6 Moisture	, o	1.09		a (Table 1):	Correction Factor a
98.1%	98.1%	0.96	#100	382.07	10.66	't. (C-A)	Dry Wt.	HI.	100.0%		7,000	% Passing #10:
99.4%	99.5%	0.27	09#	56.40	0.04	Wt. (B-C)	Water Wt.	ם	49.81		ple Oven Dried (W):	Hydrometer Sample Oven Dried
99.9%	99.9%	0.04	#40	398.46	26.29	Dry Wt. + A	Dry	C	311.36		en Dried:	Total Sample Oven Dried
99.9%	99.9%	0.03	#20	454.86	26.33	Wet Wt. + A	· Wet	В	50.00	ole (g):	Weight of Air Dried Hydrometer Sample (g):	Weight of Air Dr
100.0%	%0.00I	0.03	#10	16.39	15.63	Tare Wt.		A	312.53		Weight of Total Sample Air Dried:	Weight of Total S
100.0%	TP1101A1 IIOC	0.0	14#	Star	35	Tare #			312.53	(grams):	+ tare wt.	Total Sample Air Dried Wt.
100.0%	Soil Montan	0.0	3/8"	Natural	Hygroscopic	Moisture Content	Moisture	_			(grams):	Pan Tare Weight (grams):
100.0%		0.0	1/2"					_				Hydrometer Jar #
100.0%		0.0	3/4"	2.200	Apparent Relative Density (Assumed)	Relative Densi	Apparent l			Beaker #:		Pan #:
100.0%	(washed)	0.0	1.0"							Silt (ML)	tion: Black Gray Silt (ML)	Sample Description:
100.0%	ran #	0.0	1.5"	NA	Elevation:	Elev		NA NA	Offset:	0	Grid C3	Location:
100.0%	# # # # # # # # # # # # # # # # # # #	0.0	3.0"	7/5/12 & 7/12/12		Sample Date:		SG-3	Sample #: S	Sam	NA	Boring #:
Passing	Percent Passing	Retained Wt.	Sieve	IC 28202	526 South Church Street, Charlotte, NC 28202	South Church S	٠	Address			Duke Energy	Client Name:
\$ *			•		7/28-8/10/12	Test Date(s): 7/28	Test D	3&4	o. 1 Cells -	ial Landfill N	Marshall Industrial Landfill No. 1 Cells - 3&4	Project Name:
					/12	Date: 8/10/12	Report Date:			ase 03	1356-11-032 Phase 03	Project #:

S&ME, Inc. - Corporate

Jennifer Olsen/Karen Warner

Technician Name Jumudo

式OO以,,Certification #

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

Project Engineer

Position

\$\_1/5/1z Date

1356-11-032 Phase 03 SG-3 Hydroxls Page 1 of 1 NICET 117900

Revision Date: 02/20/08

### Particle Size Analysis of Soils



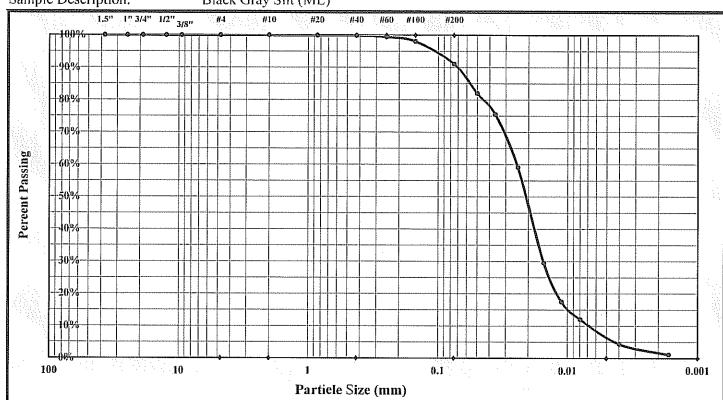
ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Ph	ase 03	Report Date:	8/10/12
Project Name:	Marshall Indust	rial Landfill No. 1 Cells - 3&4	Test Date(s):	7/28-8/10/12
Client Name:	Duke Energy			
Address:	526 South Chur	ch Street, Charlotte, NC 28202		
Boring #:	NA	Sample #: SG-3	Sample Date	e: 7/5/12 & 7/12/12
Location:	Grid C3	Offset: NA	Elevation	n: NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10		Gravel:	0.0%		Silt	85.0%
Silt & Clay (% Passing #200):	91.0%	Tot	tal Sand:	9.0%		Clay	6.0%
ent Relative Density (Assumed)	2.200	Moisture	Content	14.8%		Colloids	
Liquid Limit	NP	Plast	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.0%	Mediu	ım Sand:	0.1%		Fine Sand:	8.9%
Description of Sand and Gravel	Rounded 🛚	Angular ⊠	Hard & Durabl	e 🗵	Soft	☐ Weathered &	È Friable □
Mechanical Stirring Apparatus A	Dispersion Per	iod: 1 min.	Dispersing Ager	nt: Soc	ium Hexa	unetaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: ( MUM NAMIC Date: 7/15/17

Kyle Baucom
Technical Responsibility
Signature

Project Engineer

Position

&/*|5/*12 Date

Revision No. 0

Another code

### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date:	II	1/2	O/	07

ASTM D 4318

AASHTO T 89

AASHTO T 90

**Onality Assurance** 

S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1356-11-032 Phase 03 Report Date: 8/10/12

Marshall Industrial Landfill No.1- Cells 3&4 Project Name: Test Date(s) 7/28-8/10/12

Client Name: Duke Energy

526 South Church Street, Charlotte, NC 28202 Client Address:

Boring #: NA Sample #: SG-3 Sample Date: 7/5/12 &7/12/12

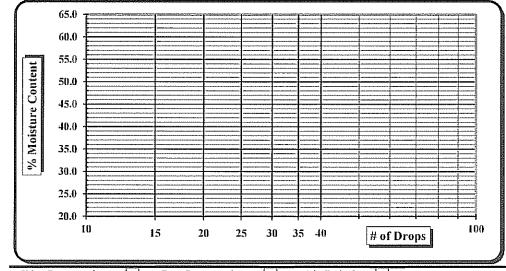
Location: Grid C3 Offset: NA Elevation: NA

Sample Description: Black Gray Silt (ML)

Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 12/20/2012 3222 6/25/2012 Grooving tool 20165 LL Apparatus 20230 6/26/2012 Grooving tool

10844 5/9/2012 Grooving tool Oven

OVCII	TOOT:	T 3.50 33.1	J1712U12	UIU	JVIIIg (OOI	NA STATE		onter by arter of the Arbital of	
Pan #				Liquio	l Limit			Plastic Limit	
A 14	Tare #:		V						10 14
A	Tare Weight								
В	Wet Soil Weight + A					·			
С	Dry Soil Weight + A								
D	Water Weight (B-C)								
Е	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS							Moisture Contents determ	iined
LL	LL = F * FACTOR			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		i V	THE STATE OF	by ASTM D 2216	71.W 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1
Ave.	Average	1.50 m							



	One Point I	Liquid Limit	
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0,99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic X

Liquid Limit Plastic Limit

Plastic Index

Group Symbol ML

Multipoint Method One-point Method

Estimate the % Retained on the #40 Sieve: Wet Preparation Dry Preparation 1 Air Dried 1

Notes / Deviations / References:

Oven Temperature Set at 60C.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name

Kyle Baucom Technical Responsibility

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4

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

### S&ME, Inc.~9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #: 1	356-11-032		Phase	03	Report I	Date:	8/10/12
Project Name: N	Marshall Industria	ıl Landfill No	. 1 - Cells 3 &	. 4	Test Da	te(s)	8/8-10/12
Client Name: I	Duke Energy						
Client Address: N	<b>V1</b>						
Boring #: N	NΑ	Sa	mple #:	SG-3	Sample I	Date:	7/5/2012
Location: C	Grid C3	(	Offset:	NI	De	epth:	NA
Sample Description	Č[11.0].	ay Silt (ML)					
Type and Specification	법화 얼마 아니라 생각하다 나는 회사가 되었다.	4 - 178 (81)	No foreign Color and the Color of the Color	e and Specificat	ion S&	ME ID #	Cal Date:
Balance (0.1 g)	22183			npaction Mold		20231	1/6/2012
Balance	22182			npaction Hamme		20222	6/6/2012
Straightedge	20179		2012 Ove	n i de la		22151	7/13/2012
Sieve	22100		2012				
Water Content	용한 4 - 트롤로 1995 - 트롤로 1995	사 그 작용 화병하죠. 그 안속되었	iP 2 Balance (0	),1 gram Readab		Check:	
ASTM D2216		TO T265 □	100	ASTM D4959			D4643 □
	Water Added:	The Control of the Co	400	450	500	550	
A T WILL	Tare #:	JDM 150.2	G	5A	698	MJD	
A. Tare Weight	A.	159.3	157.3	159.6	154.6	160.3	
B. Wet Wt + Tare \	275.4.2	804.9	1097.7	1043.5	1022.3	990.7	
C. Dry Wt. + Tare	······································	690.1	911.3	856.5	826.0	791.1	
D. Water Weight	B-C	114.8	186.4	187.0	196.3	199.6	
E. Dry Weight	C-A	530.8	754.0	696.9	671.4	630.8	
F. Moisture Conte	nt 100*D/E	21.6%	24.7%	26.8%	29.2%	31.6%	
Compaction Data ASTM D558 □ Method A ☒	Requires : ASTM D 698 Method B	⊠ AS	TM D1557 🗆	gram or .0022 LI AASHTO Method D (AS		- 1 5 H H H H H H H H H H H H H H H H H H	HTO T180 ☐ FO Method D ☐
G. Wt of Soil + Mo	ld G.	5637	5698	5749	5748	5722	
H. Wt. of Mold	<b>∀H.</b> ∜	4241	4241	4241	4241	4241	
I. Wt. of Soil (g. or	lbs.) G-H	1396	1457	1508	1507	1481	
J. Wt of Soil (Lbs.)	1/453.6 or 1	3.078	3.212	3.325	3.322	3.265	
K. Mold Volume Fa	actor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCI	F) J*K	92.6	96.6	100.0	100.0	98.2	
M. Dry Density (PC	CF) L/(1+F)	76.2	77.5	78.9	77.4	74.6	
Sieve Size used to separ Mechanical Rammer References / Comments	🗵 Manual	Rammer 🗆	#4 Sieve	Moist Prepa		Dry Pre	3/4 inch Sieve □ paration ☑

Jennifer Olsen Technician Name

\_\_\_\_\_

Kyle Baucom
Technical Responsibility

January 40lsw Signature

NICET / 117926
Certification Type/No.

carry teamon Type 71.0.

Project Engineer

Project Engineer

Position

<u> \$/)5/12</u> Date

8/10/2012

Date

Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance

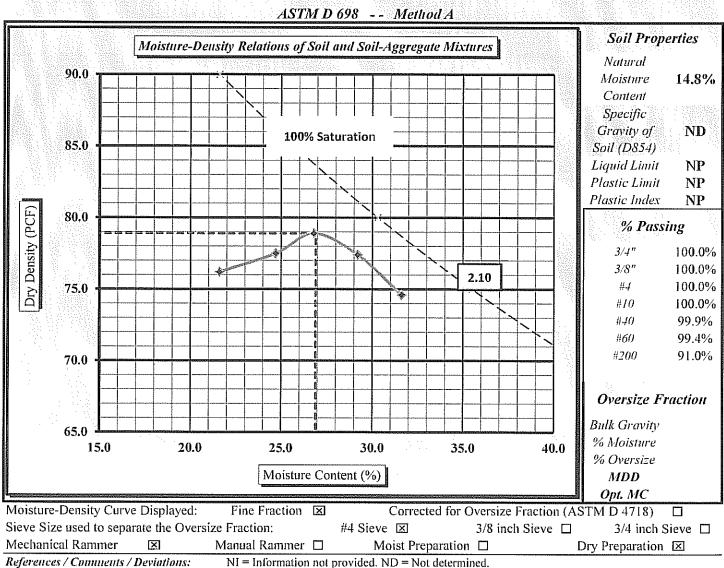
	2012 C. C. C. L. SOVER D. LANCE S.	1 23 11 1	A C S (2.5 A S 4.5 B) (1.5 A S 4.5 B)	1,111,15
ET O TANKET TO	07740	Pine Boulevar		RICH AGAMA.
N / S 7 19/8 51 8 31 / 2	17 / % 1 % (A) 1 T 11 (A) 1971	PIERO CONTINUES	パー じ じいいしじんりかい	N 8 ' 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
LICH IVE ST. BUILDING		1 1116 13171816 V 411		

		4.7	化二甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基	The state of the s	N 6
S&ME Project #:	1356-11-032	Pha	se 03	Report Date:	8/10/12
Project Name:	Marshall Industrial	Landfill No. 1 - Co	ells 3 & 4	Test Date(s):	8/8-10/12
Client Name:	Duke Energy				
Client Address:	NI				
Boring #:	NA	Sample #:	SG-3	Sample Date:	7/5/2012
Location:	Grid C3	Offset:	NI	Depth:	NA
Sample Description	Dlade Care C:	1+ (3.41.)			

Sample Description: Black Gray Silt (ML)

Maximum Dry Density

78.9 PCF. **Optimum Moisture Content** 26.9%



Jennifer Olsen Jennudy 20law Technician Name: Date: 8/10/12

Technical Responsibility Position This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Kyle Baucom

Project Engineer

Revision Date: 02/20/08

1356-11-032 Phase 03

## Particle Size Analysis of Soils



ASTM D 422

# S&ME, Inc. ~ 9751 Southeru Pine Boulevard ~ Charlotte, NC 28273

References / Comments / Deviations % Passing #10: Pan Tare Weight (grams): Correction Factor a (Table 1): Total Sample Oven Dried: Weight of Air Dried Hydrometer Sample (g): Hydrometer Jar #: Sample Description: Description of Sand & Gravel Particles Hydrometer Sample Oven Dried Weight of Total Sample Air Dried: Boring #: Chent Name: Project Name: Total Sample Air Dried Wt. + tare wt. (grains): Location: Pan #: Control Cylinder Stirring Apparatus: Balance: 60 (Min.) 30 5 Grid C3 Marshall Industrial Landfill No. 1 Cells 3&4 Duke Energy ID No.Black Gray Silt (ML) 21.5 21.521.5 21.5 0.5 °C) 21.5 21.5 21.5X **X** 3222 X Beaker #: ASTM D 422, D 2487, D 4318 Composite Correction Hydrometer Reading 32.5 40.0 45.0 11.5 19.5 14.5 Rounded 8.0  $\boldsymbol{\varpi}$ Sample #: Offset: Cal. Date: 300.77 300.77 49.86 299.92 50.00 100.0% 1.09 Control Cylinder 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 Corrections SG-4 Z Address: Angular 6/25/2012 Ŭ Ö  $\square$ Ţ,  $\Rightarrow$ % Moisture (100 x D/E) Correction Composite Apparent Relative Density (Assumed) Moisture Content Report Date: 8/10/12 Dry Wt. Water Wt. (B-C) Test Date(s): 7/28-8/10/12 526 South Church Street, Charlotte, NC 28202 Dry Wt. + A Wet Wt. + A Tare Wt. Hydrometer 14.50 27.50 35.00 40.00 0.506.50 9.503.00 (C-A) Dispersion Time: Hard & Durable Sample Date: Hydrometer: Elevation: Hygroscopic (R x a / W) x 100 0.28%26.39 26.42 10.62 0.0315.77 P(-#10) =20.8%31.7% 60.1% 76.5% 87.4% 14.2% 6.6%1.1% ID No. 7/5/12 & 7/12/12 Percent Passing 1 min. Natural Ä 549.96 566.31 654.21 2.200 87.90 16.0% 16.35 301 P x % Passing #10 151H Soft P(total) =31.7% 60.1% 87.4% 76.5% 6.6%14.2% 20.8%3901 Sodium Hexametaphosphate: 1.1% Sieve #100 #200 #10 3/8" 3/4" 3.0" #60 #40 #20 1/2" 1.0" 1.5 #4 Retained Wt. Weathered & Friable Effective Depth Cal. Date: 16.2 15:2 14.7 13.9 11.8 10.6 4.09 0.88 0.240.02 0.010.000.015.8 0.00.0 0.0 0.0 0.0 152H Soil Mortar 0.01571 0.01571 0.01571 0.01571100.0% (washed) 0.01571 0.01571 0.015710.01571Table 3 91.8% 98.2% 99.5% 100.0% 100.0% 40 g./ Liter Pan# 3/25/2012 Percent Passing K x ((L/T)<sup>1/2</sup> 0.02412Diameter 91.8%0.01101 0.015140.03610 0.04903 0.001670.003950.00792 98.2% 99.5% 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 00.0%

S&ME, Inc. - Corporate

Oven Temperature was set at 60C.

lennifer Olsen/Karen Warner

NICET 117900

Certification #

Technician Name

3201 Spring Forest Road

Technical Responsibility

Kyle Baucom

Project Engineer

1356-11-032 Phase 03 SG-4 Hydro.xls Page I of I

Revision Date: 02/20/08

### Particle Size Analysis of Soils



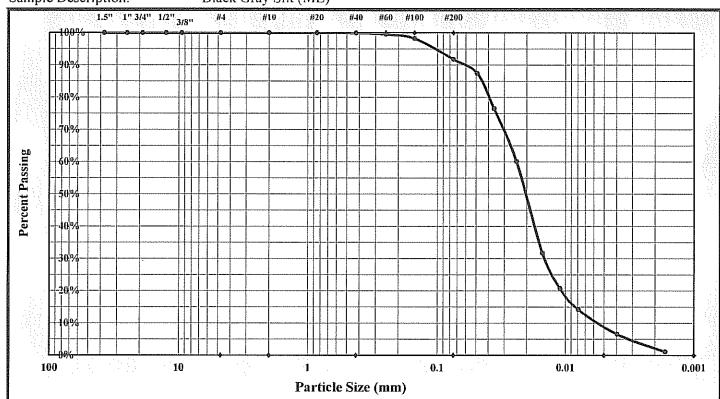
ASTM D422

Quality Assurance

### S&ME, Inc. ~9751 Southern Pine Boulevard ~ Charlotte, NC 28273

				the state of the s
S&ME Project #:	1356-11-032 Ph	ase 03	Report Dat	te: 8/10/12
Project Name:	Marshall Indust	rial Landfill No. 1 Cells 3&	Test Date(	s): 7/28-8/10/12
Client Name:	Duke Energy .			
Address:	526 South Chur	ch Street, Charlotte, NC 282	02	
Boring #:	NA	Sample #: SG-4	Sam	ple Date: 7/5/12 & 7/12/12
Location:	Grid C3	Offset: NA		Elevation: NA

Sample Description: Black Gray Silt (ML)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm
Maximum Particle S	Size: #20	Gravel: 0.0%	Silt 83.3%

Maximum Particle Size:	#20		Gravel:	0.0%		Silt	83.3%
Silt & Clay (% Passing #200):	91.8%	То	tal Sand:	8.2%		Clay	8.5%
ent Relative Density (Assumed)	2.200	Moisture	Content	16.0%		Colloids	
Liquid Limit	NP	Plas	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.0%	Medit	ım Sand:	0.0%		Fine Sand:	8.2%
Description of Sand and Gravel	Rounded 🗆	Angular □	Hard & Durab	ole 🗆	Soft	☐ Weathered &	k Friable 🛚
Mechanical Stirring Apparatus A	Dispersion Per	iod: I min.	Dispersing Age	ent: Sc	dium Hexa	umetaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: All Walle Date: 8/10/12

Kyle Baucom
Technical Responsibility

Project Engineer
Signature Position

\$\)\$\|12 Daie

### Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

### S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

	356-11-032		Phase		Report 1		8/10/12
Project Name: N	Aarshall Industria	ıl Landfill No.	1 - Cells 3 &	4	Test Da	ite(s)	8/8-10/12
Client Name: [	Ouke Energy						uv syali bilan Bilahas
Client Address: N	\I						
Boring #: N	NI .	Saı	nple #:	SG-4	Sample l	Date:	7/12/2012
Location: C	Grid C3	O	ffset:	NI	D	epth:	NI
Sample Description		ay Silt (ML)			***************************************		
Type and Specificatio	4、大块5点,其外线点点。 人名德特特尔 1000			e and Specificati		EME ID#	Cal Date:
Balance (0.1 g)	22182			paction Mold		20231	1/6/2012
Balance	22182			paction Hamme	1000,000000	20222	6/6/2012
Straightedge	20179					22151	7/13/2012
Sieve	22100						
Water Content			P 2 Balance (0	).1 gram Readab		Check:	4 D4642 E
ASTM D2216	The state of the s	ITO T265 🛘	450	ASTM D4959	300	ASIN	1 D4643 □
	Water Added:	- 12/00/10/00 200/00/00/00 T	450 6910	350 BE	JMD		
	Tare #:	5B	*******	20000 6000 000 000 0000	10.000.000.000		
A. Tare Weight	Α.	160.3	155.7	163.9	163.6		
B. Wet Wt + Tare \		1045.7	949.9	1035.6	979.9		
C. Dry Wt. + Tare '		865.9	7 <b>7</b> 4.7	870.3	840.3		
D. Water Weight	B-C	179.8	175.2	165.3	139.6		
E. Dry Weight	C-A	705.6	619.0	706.4	676.7		
F. Moisture Conte	nt 100*D/E	25.5%	28.3%	23.4%	20.6%		
Compaction Data			경기이다 - 항문하였다. 이외왕왕, 원	gram or .0022 Ll	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	아니는 얼마나 그리는 기를 가셨다.	
ASTM D558 □	ASTM D 698	District of Admit Artists of the Admit Series	ΓM D1557 □	AASHTO	3.449-880-060	EALD-ANGEL OF CHANGE	SHTO T180 🔲
Method A ⊠	******	☐ Method			TM 1978) □	AASI	ITO Method D □
G. Wt of Soil + Mo		5786	5765	5734	5673		
H. Wt. of Mold	H.	4241	4241	4241	4241		
l. Wt. of Soil (g. or	lbs.) G-H	1545	1524	1493	1432		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.406	3.360	3.291	3.157		
K. Mold Volume Fa	actor K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCI	F) J*K	102.5	101.1	99.0	95.0		
M. Dry Density (PC	CF) L/(1+F)	81.7	78.8	80.2	78.8		
Sieve Size used to separ	ate the Oversize Frac	ction:	#4 Sieve	· 🗵	3/8 inch Siev	e 🗆	3/4 inch Sieve □
Mechanical Rammer	· 🗵 Manual	Rammer		Moist Prepa		Dry Pr	eparation 🗵
References / Comments	s / Deviations:	NI = Information	not provided. N	ID = Not determin	ned.		
1	Olaan	1	101	XII.	CET / 117926		<u>8/10/2012</u>
<u>Jennifer</u> <i>Technicia</i> i		GENNIA Siena	_#WACIN	. <u>INIC</u> Certi	JETT 117920 fication Type/No.	-	0/10/2012 Date
7 commona		-J	<u> </u>	2077	,		al. 1
<u>Kyle Ba</u>	ucom	Ky C	<u> </u>	- <u>Pro</u>	ject Engineer	•	<u> </u>

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Signature

Date

Positiou

Teclinical Responsibility

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance

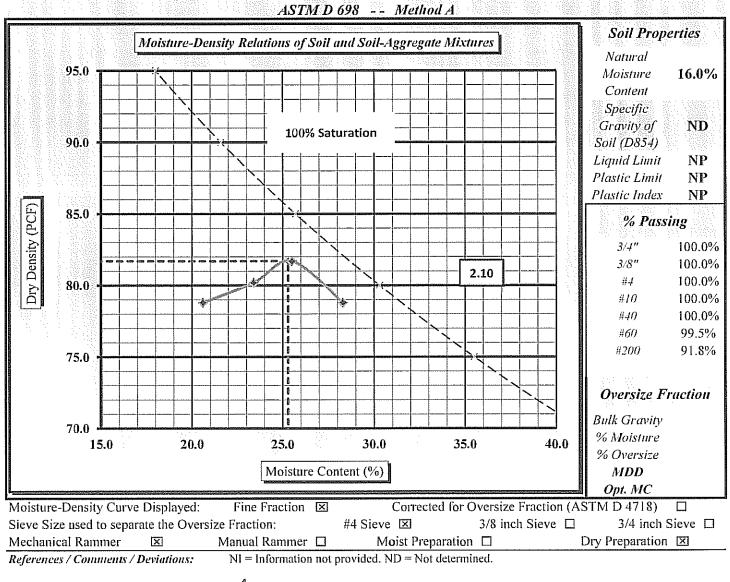
	Pine Bonlevard	

三天天 公理權 來	S&ME, Inc.~ 97:	51 Southern Pine	Bonlevard~Cha	rlotte, NC 28273	
S&ME Project #:	1356-11-032	Pho	ise 03	Report Date:	8/10/J2
Project Name:	Marshall Industrial	Landfill No. 1 - C	ells 3 & 4	Test Date(s):	8/8-10/12
Client Name:	Duke Energy				
Client Address:	NI				
Boring #:	NI	Sample #:	SG-4	Sample Date:	7/12/2012
Location:	Grid C3	Offset:	NI	Depth:	NI

Sample Description: Black Gray Silt (ML)

**Maximum Dry Density** 

81.7 PCF. **Optimum Moisture Content** 25.3%



Technician Name:

Jennifer Olsen January LOssen

Date: 8/10/12

Kyle Baucom

Technical Responsibility

Project Engineer Position

Revision No. 0

### Liquid Limit, Plastic Limit, and Plastic Index



Revision L	Date: 1 i	1/20/0	) /
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AASHTO T 89

AASHTO T 90

Quality Assurance

ASTM D 4318 X Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 8/10/12 1356-11-032 Phase 03 Report Date: Project #: Project Name: Marshall Industrial Landfill No.1- Cells 3&4 Test Date(s) 7/28-8/10/12 Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample #: SG-4 Sample Date: 7/5/12 &7/12/12 Boring #: NA Grid C3 Offset: NA Elevation: NA Location: Sample Description: Black Grav Silt (ML) Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 3222 6/25/2012 Grooving tool 20165 12/20/2012 LL Apparatus 20230 6/26/2012 Grooving tool 10844 5/9/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan # Tare #: Tare Weight A В Wet Soil Weight + A C Dry Soil Weight + A D Water Weight (B-C) E Dry Soil Weight (C-A) F % Moisture (D/E)\*100 Ν # OF DROPS Moisture Contents determined by ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 Factor Factor 60.0 20 0.974 26 1.005 0.979 27 21 1.009 55.0 % Moisture Content 22 0.985 28 1.014 50.0 23 0.99 29 1.018 45.0 0.995 30 1.022 24 000.1 25 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 100 15 20 25 30 35 40 # of Drops Multipoint Method 7 One-point Method J. Estimate the % Retained on the #40 Sieve: 1 Wet Preparation **Dry Preparation** Air Dried Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name

Kyle Baucom Technical Responsibility

Form No: TR-D2216-T265-1

Revision No. 0

Revision Date: 02/22/08

### **Laboratory Determination of Water Content**



Revision 1	Duie. 02/2	.2/00	AS	STM D 22	16 🗸	AASHTO T 2	265	Qua	lity Assurance	
			S&ME, Inc.	~ 9751 S	outhern Pine	Boulevard ~	Charlotte, N	C 28273		
Project #	<b>#:</b>	1356	6-11-032		Pl	nase 03	Report D	Date:	8/7/12	
Project N	Vame:	Mars	shall Industria	l Landfil	l No. 1 - Cells	3 & 4	Test Dat	e(s):	8/3-7/12	
Client Na	ame:	Duk	e Energy				1			
Client A				Street, C	harlotte, NC 2	28202				
Sample b			ny Addis				Sample Dat		7/25/12	
Sampling			NI				Drill I		NI	
Metho	d:	A (1%	)	B (0.19	<b>(4)</b>	Balance ID.	<i>3222</i>	Calibration D	ate: 6/25/1	
Boring No.	Samp No.		Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
	ATT MATERIAL OF		ft. or m.		grams	grams	grams	grams	%	e
	SG-	5		5	16.38	399.68	318.49	81.19	26.9%	
										***************************************
										1
										2012
										10 10 10 10 10 10 10 10 10 10 10 10 10 1
										7777777777
								:		
Notes / De	vintinge / L	2 afarar	we NI =	No inform	nation provided			MITTER CONTRACTOR OF THE CONTR		777777
					n from the botto		t.			
	00 3	· · · · · · · · · · · · · · · · · · ·	1							
ASTM D	2216: Lal	orato	ry Determination	n of Wate	r (Moisture) Co	ontent of Soil ar	nd Rock by Mas	S		
	Jennife Technica			Lenn	uly LOVE. Signature	<u>_</u>	NICET / 117 Certification Type		<u>8/7/2012</u> Date	) -
	<u>Kyle E</u> Technical R			Ryl	Z. Z		o', Ret Englise Position		<u> 8/15/12</u> Date	_
	reenatus I\	caponai		l not be repr	Б	nll, without the wri	า บริเกษก inen approval of Sc	&ME, Inc.	ыше	

## Particle Size Analysis of Soils



Revision Date: 02/20/08

### ASTM D 422

# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

And in case of the			À							e Set at 60C.	Oven Temperature Set at 60C.
							) 4318	., D 2487, E	ASTM D 422, D 2487, D 4318	nts / Deviutions	References / Comments / Deviutions
	16.2	1.1%		1.1%	0.50		0 -	5.0	5.5	21.5	1440
	16.0	3.3%	(L)	3.3%	1.50	The state of the s	0   0	5.0	6.5	21.5	250
	15.5	1.0%	1.1	11.0%	5.00			5.0	10.0	21.5	60
	15.2	14.3%	14	14.3%	6.50	e garangan kangan Salamak dangan	0	5.0	11.5	21.5	30
	14.7	21.9%	21	21.9%	10.00		S 0	5.0	15.0	21.5	15
	12.8	47.2%	47	47.2%	21.50	1 11 11	0	5.0	26.5	21.5	5
	10.9	72.4%	72	72.4%	33.00		0	5.0	38.0	21.5	2
	10.2	81.2%	81	81.2%	37.00		- A	5.0	42.0	21.5	1
	[ -	P x % Passing #10	<u> </u>	(R x a / W) x 100	R	Correction		Cylinder	Reading	(0.5 °C)	T (Min.)
1 600	Effective Depth	ing P (total) =	Percent Passing  P (to	Per P(-#10)=	Hydrometer	ons Composite	orrecti	T Control	Hydrometer	Temp.	Time
E	152H	151H	151H	Type:				Correction	Composite Correction	er ×	Control Cylinder
10	Cal. Date:	3901	. :	Hydrometer: ID No.	Hydro	6/25/2012	•	Cal. Date.	3222		Balance:
22	Sodium Hexametaphosphate:	odium Hex	1 min. S	Dispersion Time: 1	Dispersi				X B	Α	Stirring Apparatus:
80	Weathered & Friable		I Soft	Hard & Durable 区		ular 🔀	Angular		s Rounded	Description of Sand & Gravel Particles	Description of San
-	5.26	#200	26.9%	0.62%	(100 x D/E)	% Moisture	.0	1.09		a (Table I):	Correction Factor a
	1.63	#100	302.11	11.22	<sup>7</sup> t. (C-A)	) Dry Wt.	6 E	100.0%			% Passing #10:
<del> </del> —	0.93	#60	81.19	0.07	Wt. (B-C)	Water Wt.	D.	49.69		e Oven Dried (W):	Hydrometer Sample Oven Dried
<del> </del>	0.11	#40	318.49	26.96	Dry Wt. + A		5   C	235.15		Dried:	Total Sample Oven Dried
<del> </del>	0.02	#20	399.68	27.03	Wet Wt. + A		B	50.00	)le (g):	Weight of Air Dried Hydrometer Sample (g):	Weight of Air Drie
<del>                                     </del>	0.00	#10	16.38	15.74	Tare Wt.		A	236.62		mple Air Dried:	Weight of Total Sample Air Dried
0011 11301	0.0	#4	υ,	5	Tare #		2	236.62	(grams):	Total Sample Air Dried Wt. + tare wt. (grams):	Total Sample Air D
	0.0	3/8"	Natural	Hygroscopic	Moisture Content	Moisture				;rams):	Pan Tare Weight (grams):
	0.0	1/2"	and the second of the same								Hydrometer Jar #:
<u> </u>	0.0	3/4"	2.200	Apparent Relative Density (Assumed)	Relative Deus	Apparent l			Beaker #:		Pan #:
$\vdash$	0.0	1.0"							Silt (ML)	on: Black Gray Silt (ML)	Sample Description:
L	0.0	1.5"	NA	Elevation:	Elev		NA	Offset:		Grid B2	Location:
	0.0	3.0"	7/25/12	Sample Date:	Sampl		SG-5	Sample #:	Sa	NA	Boring #:
<b></b> -	Retained Wt.	Sieve	, NC 28202	526 South Church Street, Charlotte, NC 28202	South Church		Address:			Duke Energy	Client Name:
				7/25/12-8/10/12	Test Date(s): 7/2:	Test D	s 3&4	No.1-Cell	al Landfill	Marshall Industrial Landfill No.1-Cells 3&4	Project Name:
				)/12	Date: 8/10/12	Report Date:		,	ase 03	1356-11-032 Phase 03	Project#:

S&ME, Inc. - Corporate

Karen Warner Technician Name

NICET 117900

Certification #

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

Project Engineer Page I of I R/15/12 Date

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Ph	ase 03		Report Date:		8/10/12	
Project Name:	Marshall Indust	rial Landfill No.1-C	Cells 3&4	Test Date(s):	7/25	/12-8/10/12	
Client Name:	Duke Energy				N 34.54		•
Address:	526 South Chur	ch Street, Charlotte	, NC 28202				
Boring #:	NA	Sample #:	SG-5	Sample	Date:	7/25/12	
Location:	Grid B2	Offset:	NA	Elev	ation:	NA	_

<u> </u>			
Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00  mm and > 0.425  mm  (#40)	Colloids	< 0.001 mm

Particle Size (mm)

0.1

***************************************	_,						
Maximum Particle Size:	#20		Gravel:	0.0%		Silt	84.3%
Silt & Clay (% Passing #200):	89.4%	То	tal Sand:	10.6%		Clay	5.1%
int Relative Density (Assumed)	2.200	Moisture	Content	26.9%		Colloids	
Liquid Limit	NP	Plas	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.0%₁	Medit	ım Sand:	0.2%		Fine Sand:	10.4%
Description of Sund and Gravel	Rounded 🛘	Angular ⊠	Hard & Dur	able 🗵	Soft	□ Weathered &	k Friable 🔲
Mechanical Stirring Apparatus A	Dispersion P	eriod: 1 min.	Dispersing A	gent: Sod	ium Hexa	metaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

10

Technician Name: Adula Mand Date: 8/10/12

Kyle Baucom

Technical Responsibility

Signature

Project Engineer

Position

8/15/)2 Date

0.001

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Revision No. 0

### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Another code ASTM D 4318 AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 1356-11-032 Phase 03 Project #: Report Date: 8/10/12 Project Name: Marshall Industrial Landfill No.1- Cells 3&4 Test Date(s) 7/28-8/10/12 Client Name: Duke Energy Client Address: 526 South Church Street, Charlotte, NC 28202 Boring #: Sample #: SG-5 NA Sample Date: 7/25/12 Grid C3 Offset: NA Location: Elevation: NA Sample Description: Black Gray Silt (ML) Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 3222 6/25/2012 Grooving tool 20165 12/20/2012 LL Apparatus 20230 6/26/2012 Grooving tool Oven 10844 5/9/2012 Grooving tool Pan # Liquid Limit Plastic Limit Tare #: Tare Weight A В Wet Soil Weight + A C Dry Soil Weight + A D Water Weight (B-C) E Dry Soil Weight (C-A) % Moisture (D/E)\*100 F N # OF DROPS Moisture Contents determined LL LL = F \* FACTORby ASTM D 2216 Ave. Average One Point Liquid Limit 65.0 Ν Factor Ν Factor 60.0 20 0.974 26 1.005 21 0.979 1.009 27 55.0 % Moisture Content 0.985 28 1.014 50.0 23 0.99 29 1.018 45.0 0.995 24 30 1,022 1.000 25 40.0 NP. Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML100 15 35 40 20 25 30 # of Drops Multipoint Method One-point Method Wet Preparation [7] J Estimate the % Retained on the #40 Sieve: **Dry Preparation** Air Dried Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318; Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technician Name Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

Project #:	1356-11-032		Phase (		Report I		8/10/12
Project Name:	Marshall Industria	l Landfill No.	. 1 - Cells 3 &	4	Test Da	te(s)	8/8-10/12
Client Name:	Duke Energy						1942년 - 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Client Address:	NI						
Boring #:	NI	Sa	mple #:	SG-5	Sample I	Date:	
Location:	Grid B2		Offset:	NI	De	epth:	NI
Sample Description	on: Black Gr	ay Silt (ML)		*****			
Type and Specificat	ion S&ME II	그 살고 그 불편하고 있다. 살		and Specificat		ME ID #	Cal Date:
Balance (0.1 g)	22182			paction Mold		20231	1/6/2012
Balance	22182		3	paction Hamme		20222	6/6/2012
Straightedge	20179		2012 Over			22151	7/13/2012
Sieve	22100		2012				
Water Content	###[편집 : 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		GP 2 Balance (0.		생생들 회장하다 나는 사용하다. 그와	Check:	4 D4640 - E
ASTM D2216	**************************************	TO T265 □	250	ASTM D4959 300	д 350	400	1 D4643 □
	Water Added:	200 PTL	HK	300 CJ	530 5L	GH	
A .T W-:-1-4	Tare #:	. The Allerton Contractor	NA	154.9	156.2	164.5	
A. Tare Weight	Α.	169.7	160.8			970.7	
B. Wet Wt + Tare		961.4	963.4	1033.7	1037.3		
C. Dry Wt. + Tare		802.4	787.0	828.3	818.0	758.3	
D. Water Weight	B-C	159.0	176.4	205.4	219.3	212.4	
E. Dry Weight	C-A	632.7	626.2	673.4	661.8	593.8	
F. Moisture Con	tent 100*D/E	25.1%	28.2%	30.5%	33.1%	35.8%	
Compaction Date  ASTM D558   Method A	ASTM D 698 Method B			AASHTO Method D (A	T99 □ STM 1978) □	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	SHTO T180   HTO Method D
G. Wt of Soil + M		5564	5617	5662	5693		
H. Wt. of Mold	Н.	4241	4241	4241	4241	4241	
I. Wt. of Soil (g. o		1323	1376	1421	1452	1435	
J. Wt of Soil (Lbs		2.917	3.034	3.133	3.201	3.164	
K. Mold Volume	Factor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (P	CF) J*K	87.8	91.3	94.3	96.3	95.2	
M. Dry Density (	PCF) L/(1+F)	70.2	71.2	72.3	72.4	70.1	
Mechanieal Ramn		Rammer 🛘	#4 Sieve	Moist Prepa			3/4 inch Sieve E
References / Commen	uts / Deviations:	NI = Informatio	n not provided. N	D = Not determin	ned.		
	er Olsen ian Name	Janniel V.	JOSW nature	·	CET / 117926 ification Type/No.		8/10/2012 Date
	Baucom Pesponsibility	Ryl &	ature 4	1 raji	of Engineer		<u> </u>

Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



&ME Project #:	1356-11-	032	Pha	se 03	Report Date	8/10/12
roject Name:	Marshall	Industrial L	andfill No. 1 - Ce	lls 3 & 4	Test Date(s)	8/8-10/12
lient Name:	Duke Ene	ergy				
lient Address:	NI					
	N.		Sample #:	SG-5	Sample Date	
	Grid B2		Offset:	NI	Depth	NI
ample Description	: Blac	k Gray Silt (	ML)	- November 1990 and the control of t		
Maximum Dry	Density	72.6 P	PCF. - ASTM D 698 -		ptimum Moistu	re Content 32.2%
	Mainton	Dolasi				Soil Properties
	[Woisinfe-D	ensny Kemm	ous of Soil and Soi	i-Alggregate Mixi	iires	Natural
85.0						Moisture 26.9%
						Content
						Specific
80.0			100% Saturation			Gravity of ND Soil (D854)
						Liquid Limit NP
						Plastic Limit NP
		<u> </u>				Plastic Index NP
75.0 Pury Density (PCF)				**		% Passing
						3/4" 100.0
ensi						3/8" 100.0°
70.0					2.10	#4 100.09
<u> </u>						#10 100.09
						#40 99.8%
		<del>                                     </del>				#60 98.19 #200 89.49
65.0						#200 09.47
			8			
					THE COLUMN TO TH	Oversize Fraction
60.0						Bulk Gravity
20.0	25.0	3	35.0	0 40.0	0 45.0	% Moisture % Oversize
		M	loisture Content (%		in relation	MDD
aiatura Danzitu C	D:II	r: r				Opt. MC
oisture-Density Cur eve Size used to sep			nction 🗵 #4 Sie		Oversize Fraction (AS 3/8 inch Sieve	STM D 4718) $\square$ 3/4 inch Sieve $\square$
echanical Rammer	×	Manual Ra		Moist Preparation		Ory Preparation ⊠
ferences / Comments	/ Deviations:		rmation not provided			J
echnician Name:	Jennifer Ol	sen kund	es 40 m	Da	te: 8/10/12	
	Jannier Ol	Thing	er 40cm	Da	and Griding	

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision .	Date: 02/22/08	La			thon or via				
			ISTM D 22	and the second second second second second second	AASHTO T 2	evinence and the Contract of	an term maka salawa sa Salawa	ılity Assurance	
				Southern Pine	Boulevard ~			9/6/12	
Project	***************************************	6-11-032 PI		1 1 0 11	2 0 4	Report I			_
Project 1		·····	lal Landfil	1 No.1 - Cells	3 & 4	Test Dat	e(s):	3/30-9/6/12	10.00 (A.1)
Client N Client A		Energy	h Straat (	Charlotte, NC 2	28202	<del></del>			
Sample		ny Addis	ii Sileet, C	mariotte, NC 2	20202	Sample Dat	e(c)·	8/15/12	
	g Method:	NA NA				Drill 1		NA	
Metho	<del></del>		B (0.1	%)	Balance ID.	3222	Calibration L		12
Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o
		ft. or m.		grams	grams	grams	grams	%	⊥ t ∣e
NA	SG-6	NA	20	7.11	309.23	252.06	57.17	23.3%	
-									-012-04/ -012-04/ -012-04/
****									V. 100
			1						
									39.5%
									<del> </del>
									-
Notes / D	 eviations / Referer	4.000							<u> </u>
	mperature Set at								
	: Grid D3								
									***************************************
ASTM D	2216: Laborato	ry Determinat	tion of Wat	r (Moisture) C	ontent of Soil a	nd Rock by Ma	SS		
	Karen Warr Technician Nar		Pa	<u>Uu Ual</u> Signature	UL	NICET 117 Certification Typ		9/7/13 Date	2
	Kyle Bauco Technical Respons		Ky	L. H. Signature		Project Eng	ineer	<u> </u>	
	200mmon neopons	•	all not be rep	produced, except in	full, without the wi		'&ME, Inc.	2	

Revision No. 0



Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 90 AASHTO T 89 Quality Assurance ASTM D 4318 Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 9/7/12 Report Date: 1356-11-032 Phase 03 Project #: 8/30-9/7/12 Marshall Industrial Landfill No.1-Cells 3 & 4 Test Date(s) **Project Name:** Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample #: SG-6 Sample Date: 8/15/12 NA Boring #: Offset: NA Elevation: NA Grid D3 Location: Sample Description: Gray Black Silt (ML) Fly Ash S&ME ID# Cal Date: Type and Specification S&ME ID # Cal Date: Type and Specification 20165 12/20/2011 3222 6/25/2012 Grooving tool Balance (0.01 g) 20230 6/26/2012 Grooving tool LL Apparatus 10844 5/9/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight A Wet Soil Weight + A В C Dry Soil Weight + A Water Weight (B-C) D E Dry Soil Weight (C-A) % Moisture (D/E)\*100 F # OF DROPS Moisture Contents determined N by ASTM D 2216 LL LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 Factor N **Factor** N 60.0 20 0.974 26 1.005 21 0.979 27 1.009 55.0 % Moisture Content 1.014 22 0.985 28 50.0 23 0.99 29 1.018 0.995 30 1.022 24 45.0 25 1.000 40.0 X NP, Non-Plastic 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML100 15 20 25 30 35 40 # of Drops Multipoint Method One-point Method Estimate the % Retained on the #40 Sieve: 1 Air Dried **Dry Preparation** Wet Preparation Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technical Responsibility Technician Name

### Form No. TR-D422-2

Revision No. 0

## Particle Size Analysis of Soils

S&IME

Revision Date: 02/20/08

ASTM D 422

# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Pan Tare Weight (grams): Project Name: Project #: Correction Factor a (Table 1): % Passing #10: Hydrometer Sample Oven Dried (W): Weight of Air Dried Hydrometer Sample (g): Weight of Total Sample Air Dried Hydrometer Jar #: Client Name: References / Comments / Deviations Description of Sand & Gravel Particles Total Sample Air Dried Wt. + tare wt. (grams): Sample Description: Gray Black Silt (ML) Boring #: Pan #: Location: Total Sample Oven Dried: Control Cylinder Balance: Stirring Apparatus: Time 1440 60 30 15 Marshall Industrial Landfill No.1 Cells - 3 & 4 Grid D3 Duke Energy 1356-11-032 Phase 03 ID No.  $(0.5 \, ^{\circ}\mathrm{C})$ Temp. 23.5 24.0 24.0 24.0 24.0 24.0 24.0 24.0  $\times$ 3222 × Beaker #: **Composite Correction** ASTM D 422, D 2487, D 4318 Hydrometer Reading 11.0 14.5 23.0 39.0 42.5 10.0 Rounded 7.5 ₩ Sample #: Offset: Cal. Date: 288.76 49.80 287.23288.76 [00.0% 50.07 1.09 Control Cylinder 4.5 4.5 4.5 4.5 4.5 4.5 4.5 Corrections SG-6 NA Address: Angular 6/25/2012 П D a  $\square$  $\triangleright$ % Moisture (100 x D/E) Correction Composite Apparent Relative Density (Assumed) Moisture Content Test Date(s): 8/30-9/7/12 Report Date: Water Wt. (B-C) Dry Wt. 526 South Church Street, Charlotte, NC 28202 Dry Wt. + A Wet Wt. + ATare Wt. Lare # Hydrometer Fly Ash 6.50 10.00 18.50 34.50 38.00 (C-A) 5.50 3.00Dispersion Time: .50 Hard & Durable Sample Date: Hydrometer: 9/7/12 Elevation: Hygroscopic  $(R \times a/W) \times 100$ 0.53% Type: 27.00 27.06 11.26 0.06 15.74 P(-#10) =21.9% 40.5% 75.5% 83.2% 3.3% 6.6% 12.0% 14.2% ID No. Percent Passing 1 min. 8/1/512 NA 244.95 23.3% 252.06 309.23 Natural 2.200 P x % Passing #10 20 151H Soft P(total) =21.9% 40.5% 75.5% 83.2% 3901 3.3% 6.6% 14.2% 12.0% Sodium Hexametaphosphate: Sieve #200 #100 #40 3/8" 3/4" 3.0" #10 #60 #20 1/2" 1.0" 1.5 #4 Retained Wt. Weathered & Friable Effective Depth 0.04Cal. Date: 0.280.00 0.00 14.7 10.6 1.43 13.3 10.1 0.0 16.0 15.8 15.4 15.2 0.0 0.0 0.0 0.0 0.00.0 152H Soil Mortar 0.0152697.1% (washed) 0.01526 0.01526 89.3% 99.4% 99.9% 0.01535 0.01526 0.01526 0.01526 0.01526 100.0% Table 3 100.0%  $\boxtimes$ Pan# 40 g./ Liter 3/25/2012 Percent Passing  $K \times ((L/T)^{1/2}$ 0.04839 Diameter 0.01087 97.1% 99.4% 0.00384 0.00773 0.01508 0.02484 0.03518 100.0% 0.0016299.9% 100.0% 100.0%100.0% 100.0% 100.0% 89.3% 100.0%100.0% 100.0%

S&ME, Inc. - Corporate

Oven Temperature Set at 60C.

Karen Warner
Technician Name

NICET 117900

Certification #

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

Project Engineer

9/7/12

Position

1356-11-032 Phase 03 SG-6 Hydro.xls Page 1 of 1 Revision No. 0

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

COME Inc.	. 0751 Southon	n Dina Raulayard	Charlotte, NC 28273
SOUVER HILL	~ 7/31 30mmer	u rine Domevalu ~	CHAPTORICANC 404/3

S&ME Project #:	1356-11-032 Ph	ase 03	Report Date:	9/7/12
Project Name:	Marshall Industr	rial Landfill No.1 Cells - 3 & 4	Test Date(s):	8/30-9/7/12
Client Name:	Duke Energy			
Address:	526 South Chur	ch Street, Charlotte, NC 28202	— The first park of the state	
Boring #:	NA	Sample #: SG-6	Sample Date	: 8/1/512
Location:	Grid D3	Offset: NA	Elevation	: NA

Fly Ash Gray Black Silt (ML) Sample Description: 1.5" 1" 3/4" 1/2" 3/8" #10 #20 #40 #60 #100 #200 Percent Passing 0.1 0.01 0.001 10 1 Particle Size (mm)

Cobbles	< 30	0 mm (12") and	1 > 75 mm (3")		Fine Sand	< 0.425  mm and > 0.07	5 mm (#200)
Gravel	< '	75 mm and > 4	.75 mm (#4)		Silt	< 0.075  and > 0.0	05 mm
Coarse Sand	< 4	.75 mm and >2	.00 mm (#10)		Clay	< 0.005 mm	1
Medium Sand	< 2,0	00 mm and > 0	.425 mm (#40)		Colloids	< 0.001 mm	1
Maximum Particle S	ize:	#40		Gravel:	0.0%	Silt	80.8%
Silt & Clay (% Passing #2	00):	89.3%	Te	tal Sand:	10.7%	Clay	8.5%
ent Relative Density (Assum	ned)	2.200	Moisture	e Content	23.3%	Colloids	
Liquid L	imit	NP	Plas	stic Limit	NP	Plastic Index	NP

Fine Sand: 10.6% Coarse Sand: 0.0%Medium Sand: 0.1% Weathered & Friable □ Hard & Durable Soft Description of Sand and Gravel Rounded Angular 

40 g./ Liter Mechanical Stirring Apparatus A Sodium Hexametaphosphate: Dispersion Period: 1 min. Dispersing Agent:

Raleigh, NC. 27616

References / Comments / Deviations: ASTM D 4318, D 854, D 2487 Oven Temperature Set at 60C.

Date: Technician Name:

> Technical Responsibility Signature Position This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

**Project Engineer** 

Kyle Baucom

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

<b>J</b>	356-11-032	1 1 1 1 2 2 2	Phase		Report I		9/7/12
	arshall Industria	l Landfill No	. 1 - Cells 3 &	4	Test Da	te(s)	9/5-7/12
	uke Energy						
	26 South Church		···········		-		
Boring #: N			mple #:	SG-6	Sample I		8/15/2012
	rid D3		Offset:	N1	De	epth:	NI
Sample Description:		ay Silt (ML)		Fly Ash		ofes illiant and a testing	
Type and Specification				e and Specificat		ME ID #	Cal Date:
Balance (0.1 g)	22182			paction Mold		20231	1/6/2012
Balance	22182			paction Hamme		20222 I 1072	6/6/2012 7/13/2012
Straightedge Sieve	20179 22100	desired and the second second second	2012 Over			110/2	7/13/2012
The state of the s			GP 2 Balance (0	1 arom Doodok	.:Ii.e.n	Check:	
Water Content ASTM D2216		TO T265 $\Box$	JF 2 Dalalice (U	ASTM D4959			1 D4643 □
ASTRI DZZIO K	Water Added:	450	500	400	350	300	ט נוסדע ב
	Tare #:	51	6910	698	5C	JC	
A. Tare Weight	A.	162.4	155.6	154.6	156.1	164.0	
B. Wet Wt + Tare W	K2000000000000000000000000000000000000	1009.8	921.0	1023.9	1035.0	1008.8	
C. Dry Wt. + Tare V	1000 STORY (1000 STORY )	805.3	724.3	826.7	848.8	843.0	
	B-C	204.5	196.7	197.2	186.2	165.8	
D. Water Weight							
E. Dry Weight	C-A	642.9	568.7	672.1	692.7	679.0	
F. Moisture Conter	\$1,000 \$1,000 \$2,000 \$4,000.	31.8%	34.6%	29.3%	26.9%	24.4%	
Compaction Data			e for ASTM (1 g			Check:	
ASTM D558	ASTM D 698		STM D1557 □	AASHTC			SHTO T180   ITO Method D
Method A ⊠ G. Wt of Soil + Mol	Method B d G.	☐ Method 5698	1 C □ □ 5670	5690	STM 1978) □ 5637	5588	110 Method D L
	N. S. C. S.	·····		<del></del>			
H. Wt. of Mold	Н.	4240	4240	4240	4240	4240	
I. Wt. of Soil (g. or l		1458	1430	1450	1397	1348	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.214	3.153	3.197	3.080	2.972	
K. Mold Volume Fa		30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF	) J*K	96.7	94.9	96.2	92.7	89.4	
M. Dry Density (PC	F) L/(1+F)	73.4	70.5	74.4	73.0	71.9	
Sieve Size used to separa			#4 Sieve		3/8 inch Sieve		3/4 inch Sieve
Mechanical Rammer	⊠ Manual			Moist Prep		Dry Pr	eparation D
References / Comments	/ Deviations:	NI = Informatio	n not provided. N	ID = Not determi	ned.		
					······································		
Innifa.	Maan	f	L. & ODA	) NII	CET / 117926		9/7/2012
<u>Jennifer (</u> Technician		Sion	nature		ification Type/No.		91 112012 Date
reametan		A)	/	h	,		
Kyle Bau		Myla	15~	- Troj	ed Engineer		9/7/12
Technical Resp		€ Cu	<i>1ature</i>		D 124		Date

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



S&ME Project #:	1356-11-032	i	Phase 03	R	eport Date:	9/7/1	2
Project Name:	Marshall Indus	trial Landfill No. 1	- Cells 3 & 4	Т	est Date(s):	9/5-7/	12
Client Name:	Duke Energy						
Client Address:	526 South Chui	rch Street, Charlotte	e, NC 28202				
Boring #: NI		Sample #:	SG-	-6 Sa	imple Date:	8/15/20	)12
Location: Gr	id D3	Offset:	NI		Depth:	NI	
Sample Description:	Black Gray	y Silt (ML)	Fly A	sh		an magana Manah masa mana masa na kata	stretter och braker tilbrik
Maximum Dry I	Density 74.5	5 PCF. <i>ASTM D 69</i>	8 Meth	•	m Moistui	re Content	29.5%
	Moisture-Density	Relations of Soil and	l Soil-Aggreg	ate Mixtures		Soil Prop	erties
85.0						Natural Moisture	23.3%
						Content	23.37
		100% Saturation	1			Specific Gravity of	ND
80.0						Soil (D854)	NID
						Liquid Limit Plastic Limit	NP NP
						Plastic Index	NP
75.0	5 0000 0000 0000 0000 0000 0000 0000 0					% Pass	
75.0 To Density (PCF)				2.10		3/4" 3/8"	100.0%
70.0 T				2.20		#4	100.07
		8			$\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow$	#10	100.09
						#20	100.09
						#40	99.9%
65.0						#200	89.3%
						Oversize F	raction
60.0		i i				Bulk Gravity	
20.0	25.0	30.0	35.0	40.0	45.0	% Moisture	
		Moisture Conte	nt (%)			% Oversize <b>MDD</b>	
		Wildistare Conte	(70)			Opt. MC	
Moisture-Density Curv	e Displayed:	Fine Fraction 🗵	Correc	cted for Oversize	Fraction (AS	STM D 4718)	П
Sieve Size used to sepa			4 Sieve ⊠		ch Sieve 🗆	3/4 inch	
Mechanical Rammer		nual Rammer   II = Information not pro		eparation   ct determined		Ory Preparation	×
References / Comments / Technician Name:		Genneter LOES		Date: 9/7/	12		

Form No: TR-D2216-T265-1

Revision No. 0

Revision Date: 02/22/08

### **Laboratory Determination of Water Content**



Project #	!• 1	356-11-032 Ph				Report D	C <b>28273</b> ate:	9/14/12	
Project N		arshall Industri		1 No.1- Cells 3	& 4	Test Date		9/11-14/12	
Client Na		uke Energy			-		.(-).		
Client Ac		26 South Churcl	1 Street, C	Charlotte, NC 2	8202				
Sample b	y: K	yle Baucom		***************************************		Sample Date	e(s):	9/7/12	***************************************
Sampling	Method:	NA				Drill F	Rig:	NA	
Metho	d: A(	(1%)	B (0.1	%)	Balance ID.	3222	Calibration D	ate: 6/25/.	20.000000000000000000000000000000000000
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
		ft. or m.		grams	grams	grams	grams	%	e
NA	SG-7	NA	T-6	81.48	331.23	300.07	31.16	14.3%	
									340000
Notes / De	viations / Ref	erences							
Oven Ten	perature Se	t at 60C.							
· · · · · · · · · · · · · · · · · · ·		-		MITT				*****	
ASTM D	2216: Labor	ratory Determinat	ion of Wate	r (Moisture) Co	ontent of Soil a	nd Rock by Mas	S		
				1.//				9/1	1/12
	Karen W		TAN	MM MANA Signature	M	NICET 1179 Certification Type		/// // Date	1/
	Kyle		N	1 171				alini	
	Klye Ba		/k.e	Signatura		Project Engin	<u>neer</u>	<u>"// / / / / / / / / / / / / / / / / / /</u>	
	Technical Resp	วงกรเอนนุ		Signature		Position		Duie	

3201 Spring Forest Road 1356-11-0

Raleigh, NC. 27616

### Form No. TR-D422-2

## Particle Size Analysis of Soils

**S&ME** 

Revision No. 0

Revision Date: 02/20/08

ASTM D 422

# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

 $K \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 100.0%100.0% 99.4% 97.4% Diameter 100.0%100.0% 100.0% %6.66 0.04879 0.01474 0.01066 0.00385 0.00163 %6.66 %1.06 0.03559 0.02383 0.00767 Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar (washed) Table 3 0.01526 0.01526 0.01526 0.01526 100.0% 99.4% 97.4% 0.01526 0.01526 0.01526 0.01544 %6.66 %6.66 90.7% Pan# Weathered & Friable × Cal. Date: Retained Wt. 152H Effective Depth 4.48 0.03 90.0 0.28 1.23 10.2 10.9 12.2 14.0 14.7 15.1 15.9 16.0 0.0 0.0 0.0 0.0 0.01 Sieve Px % Passing #10 1/2" #100 #200 3/8" #10 #40 09# 1.0.1 3/4" #20 1.5" #4 P (total) =83.7% 74.6% 56.5% 31.7% 22.6% 15.8% 5.7% 3.4% 3901 Soft Percent Passing 151H 526 South Church Street, Charlotte, NC 28202 218.59 14.3% 331.23 Natural 81.48 300.07 31.16 2.200 9-L 9/7/12 NA 1 min. ID No. (Rxa/W)x100 Apparent Relative Density (Assumed) P(#10) =Hygroscopic 83.7% 74.6% 56.5% 31.7% 22.6% 15.8% 5.7% 3.4% 13.96 23.92 3.82% Type: 24.30 0.38 96.6 39 Hard & Durable Dispersion Time: 9/11-17/12 Sample Date: Hydrometer: Elevation: Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) Dry Wt. (C-A) 37.00 33.00 25.00 14.00 10.00 7.00 2.50 1.50 Moisture Content Wet Wt. + A Dry Wt. + A Report Date: Test Date(s): Tare Wt. Tare# × Composite Correction 6/25/2012 Address: Angular Corrections ی ⋖ Μ Marshall Industrial Landfill No.1 - Cells 3&4 SG-7 ASTM D 422, D 2487, D 4318 Control Cylinder Cal. Date: Fly Ash 5.0 5.0 5.0 5.0 5.0 5.0 4 Composite Correction 5.0 %0.00 279.72 269.44 279.72 50.04 48.20 1.09 Sample #: Offset: Rounded Hydrometer В Reading 12.0 42.0 38.0 30.0 19.0 15.0 7.5 Beaker #: Sample Description: Gray Black Silt (ML) Total Sample Air Dried Wt. + tare wt. (grams): 1356-11-032 Phase 03 Weight of Air Dried Hydrometer Sample (g): 3222  $\times$ Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp. (0.5°C) Oven Temperature Set at 60C. 24.0 24.0 24.0 24.0 24.0 23.0 24.0 24.0 Correction Factor a (Table 1): × Grid C1 ID No. Fotal Sample Oven Dried: an Tare Weight (grams): Stirring Apparatus: ZA Control Cylinder !ydrometer Jar #: % Passing #10: Project Name: Balance: Client Name: [ (Min.) Time 1440 250 30 09 15 S 2 Project #: 3oring #: ocation: Pan #:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900 Certification #

Karen Warner

Technician Name

1356-11-032 Phase 03 SG-7 Hydro.xls Page 1 of 1

Project Engineer

Revision No. 0

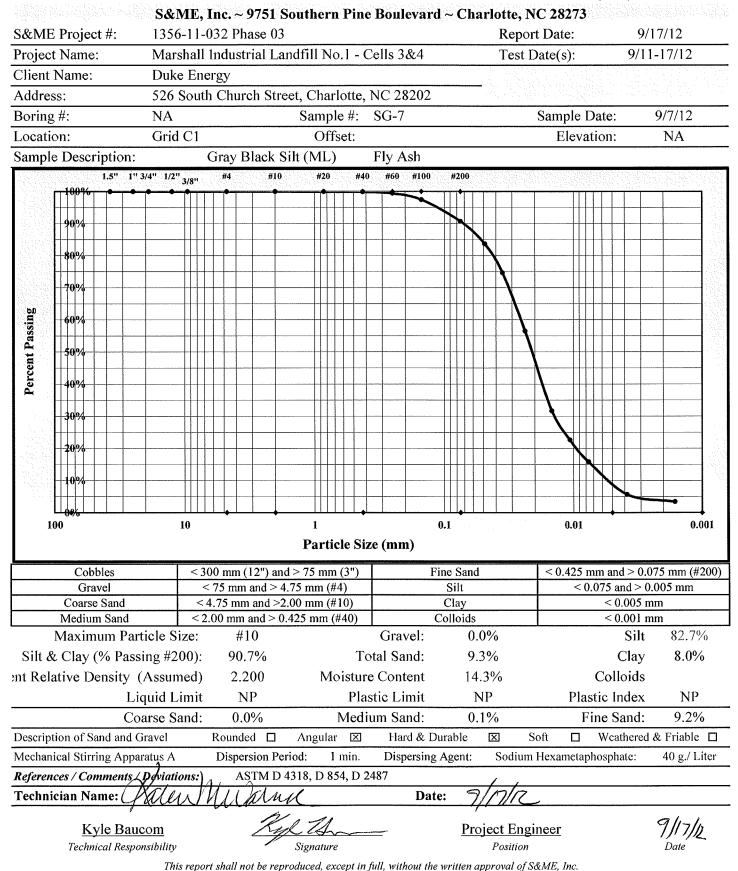
Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance



### Form No. TR-D4318-T89-90



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 89 AASHTO T 90 ASTM D 4318  $\times$ Quality Assurance Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 1356-11-032 Phase 03 Report Date: 9/17/12 Project #: 9/11-17/12 Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4 Test Date(s) Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 9/7/12 NA Sample #: SG-7 Boring #: Elevation: NA Grid C1 Offset: NA Location: Sample Description: Black Gray Silt (ML) Fly Ash Type and Specification S&ME ID# Cal Date: S&ME ID# Type and Specification Cal Date: Grooving tool 20165 12/20/2011 3222 6/25/2012 Balance (0.01 g) 20230 6/26/2012 Grooving tool LL Apparatus 10844 5/9/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight A В Wet Soil Weight + A C Dry Soil Weight + A Water Weight (B-C) D E Dry Soil Weight (C-A) F % Moisture (D/E)\*100 # OF DROPS N Moisture Contents determined by ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 Factor N **Factor** N 60.0 26 20 0.974 1.005 21 0.979 2.7 1.009 55.0 % Moisture Content 22 0.985 28 1.014 50.0 1.018 23 0.99 29 45.0 0.995 30 1.022 24 25 1.000 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 **Plastic Limit** 25.0 Plastic Index 20.0 Group Symbol ML 100 10 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method Estimate the % Retained on the #40 Sieve: 1 **Dry Preparation** Air Dried Wet Preparation Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technician Name Technical Responsibility

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



Quality Assurance

S&ME Project #:	1356-11-032	Pha	se 03	Report Date:	9/24/12
Project Name:	Marshall Industria	l Landfill No. 1 - Ce	ells 3 & 4	Test Date(s):	9/21-24/12
Client Name:	Duke Energy				
Client Address:	526 South Church	Street, Charlotte, N	C 28202		
Boring #:	NI	Sample #:	SG-7	Sample Date:	9/7/2012
	Grid C1	Offset:	NI	Depth:	NI

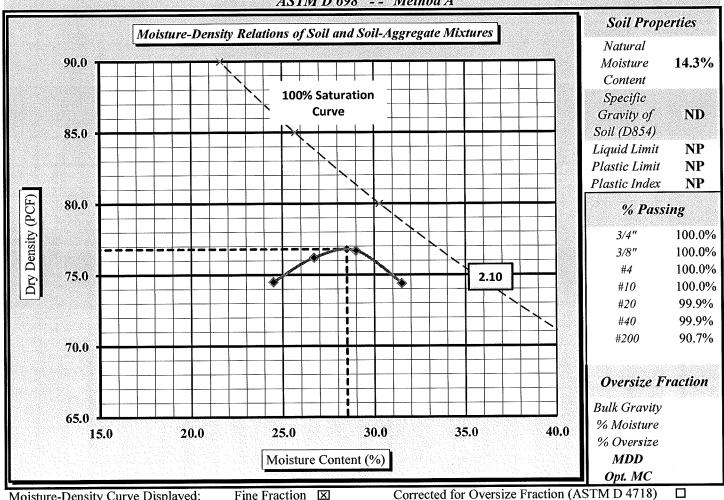
Sample Description: Gray Black Silt (ML) Fly Ash

**Maximum Dry Density** 

76.8 PCF. **Optimum Moisture Content** 

28.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: 3/4 inch Sieve □ #4 Sieve ⊠ 3/8 inch Sieve □ Sieve Size used to separate the Oversize Fraction: Manual Rammer □ Moist Preparation □ Dry Preparation 🗵 Mechanical Rammer

NI = Information not provided. ND = Not determined. References / Comments / Deviations:

Junet Lolan Date: 9/24/12 Jennifer Olsen Technician Name:

> Kyle Baucom Technical Responsibility

Revision No. 0

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

dustrial Land gy Church Stree ray Black Sil	t, Charlotte, Sample Offse	NC 28202 e #:	SG-7 NI	Sample D	Pate: 9	/7/2012
Church Stree	Sample Offse	e#:				/7/2012
ray Black Sil	Sample Offse	e#:				/7/2012
	Offse					/7/2012
		et:	NI	Do		
	4 /N AT \ T:1			De	pth:	NI
YOUR FYT YES					•	
S&ME ID #	Cal Date.		nd Specificatio		ME ID #	Cal Date:
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			ction Hammer	CHILD THAT A RECEIVED AND A SECOND CONTRACTOR		7/13/2012
AND DESCRIPTION OF THE PROPERTY OF					11072	7/13/2012
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						)4643 □
	and the second s				AUTATE	Natural
	NOTE THE PROPERTY OF THE PROPE		99			
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	Provide Branch Control to Control by Collect	CONTRACTOR OF STREET PROPERTY OF STREET	5715	5637	V ( N ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) ) ( N ( ) )	
			4239	4239		
			1476	1398		
202, 300, 300, 300, 300, 300, 300, 300,						
Tara di tara d						
Control (Sept. Sept. Sep						
AND CONTRACTOR						
	70.2				1 3	4 inch Sieve 1
Manual Ramm	ner 🔲	## Sieve E	Moist Prepai		Dry Prep	
ivianuai Kalilli						
		t provided. ND	= Not determine	ed.		
	AASHTO To Added: 3.     Added: 3.     Care #:	20179 8/7/2012 22100 4/3/2012 atter Content requires GP 2 AASHTO T265 □ Added: 500 Fare #: DMJ A. 164.2 B. 1021.4 C. 840.8 B-C 180.6 C-A 676.6 00*D/E 26.7% equires a GP 5 Balance for M D 698 ☒ ASTM 1 lethod B □ Method C G. 5696 H. 4239 G-H 1457 G or I 3.212 K. 30.09 J*K 96.6 J/(1+F) 76.2 size Fraction:	20179 8/7/2012 Oven  22100 4/3/2012  atter Content requires GP 2 Balance (0.1  AASHTO T265 □ A  Added: 500 550  Fare #: DMJ 691  A. 164.2 156.5  B. 1021.4 1006.9  C. 840.8 815.9  B-C 180.6 191.0  C-A 676.6 659.4  00*D/E 26.7% 29.0%  equires a GP 5 Balance for ASTM (1 grawn D698 ☑ ASTM D1557 □  tethod B □ Method C □  G. 5696 5732  H. 4239 4239  G-H 1457 1493  G-G or I 3.212 3.291  K. 30.09 30.09  J*K 96.6 99.0  J(1+F) 76.2 76.7  size Fraction: #4 Sieve E	20179       8/7/2012       Oven         22100       4/3/2012         atter Content requires GP 2 Balance (0.1 gram Readabil AASHTO T265 □ ASTM D4959   AASHTO T265 □ ASTM D4959   AASHTO T265 □ ASTM D4959   AASHTO T265 □ AASHTO	20179 8/7/2012 Oven  22100 4/3/2012  ater Content requires GP 2 Balance (0.1 gram Readability).  AASHTO T265 □ ASTM D4959 □  Added: 500 550 600 450  Fare #: DMJ 691 99 5L  A. 164.2 156.5 158.2 155.3  B. 1021.4 1006.9 982.1 1024.8  C. 840.8 815.9 784.8 853.6  B-C 180.6 191.0 197.3 171.2  C-A 676.6 659.4 626.6 698.3  00*D/E 26.7% 29.0% 31.5% 24.5%  equires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).  ASTM D1557 □ AASHTO T99 □  dethod B □ Method C □ Method D (ASTM 1978) □  G. 5696 5732 5715 5637  H. 4239 4239 4239 4239  G-H 1457 1493 1476 1398  K. 30.09 30.09 30.09 30.09  J*K 96.6 99.0 97.9 92.7  L/(1+F) 76.2 76.7 74.4 74.5  size Fraction: #4 Sieve ⊠ 3/8 inch Sieve	20179

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision I	Date: 02/22/08		<i>j</i>				•		
			STM D 22.		AASHTO T 2	<del></del>		ility Assurance	,
				Southern Pine	Boulevard ~			0/45/40	
Project #: 1356-11-032 Phase 03						Report Date:		9/17/12	
Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4						Test Date(s):		9/14-17/12	
Client Na		Energy	<b>.</b>	1 1 >10.0					
Client A			Street, C	Charlotte, NC 2	28202	G1- D-4	-(-).	9/13/12	
Sample by: Kyle Baucom						Sample Date(s):  Drill Rig:		NA	
Sampling Method: NA  Method: A (1%)  B (0.1%)  Balance ID.						3222 Calibration I			
	· · ·		D (0.1	70) 🖳					ĪN
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	o t
		ft. or m.		grams	grams	grams	grams	%	e
NA	SG-8	NA	S-2	83.71	351.92	305.57	46.35	20.9%	
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		-			"				
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Notes / De	   viations / Referen	1005							A 48.44 A
	nperature Set at								
			CIVIC	201:1. \0	1 - 1 - CO - 11 -	1 D - 1 1 - N -		·····	
ASTM D	2216: Laborator	ry Determinati	on of Wat	er (Moisture) C	ontent of Soil a	na Rock by Mas	SS	2/-	./
<u>Karen Warner</u> Technician Name			Signature  Signature			NICET 117900 Certification Type / No.		MMZ_ Date	
Kyle Baucom  Technical Responsibility			Signature			Project Engineer  Position		Date Date	
		•	ill not he ven	produced except in	full without the w	ritten annroval of S	&ME. Inc		

### Form No. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

Particle Size Analysis of Soils

ASTM D 422

S&ME, Inc. ~9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 9/21/12

1356-11-032 Phase 03

Project #:

 $K \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 100.0% 100.0% 100.0%100.001%0.001 Diameter 0.01534 %8.66 %9.66 99.3% 97.7% 0.04849 0.02515 0.01087 0.00386 91.7% 0.03567 0.00163 0.00781 Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar 0.01535 100.0% 0.01535 0.01526 (washed) %8.66 %9.66 91.7% Table 3 99.4% 97.7% 0.01535 0.01535 0.01526 0.01526 0.01535 Pan# Weathered & Friable × Cal. Date: Retained Wt. 152H Effective Depth 1.16 0.04 0.100.18 0.32 4.15 10.0 10.8 13.4 15.0 15.2 16.0 16.2 0.0 0.0 0.0 0.0 0.0 15.7 Sieve P x % Passing #10 #200 #1003.0" 3/4" #10 #40 09# 1.51 1.0 1/2 3/8" #20 **†**# P(total) =84.2% 73.3% 38.3% 17.5% 14.2% 3901 7.7% 4.4% Soft 151H Passing 526 South Church Street, Charlotte, NC 28202 221.86 305.57 20.9% Natural 351.92 46.35 2.200 83.71 S-2 9/13/12 NA (Rxa/W)x100DNoX Apparent Relative Density (Assumed) Hygroscopic ™P(#10) = 73.3% 84.2% 38.3% 17.5% 14.2% 7.7% 4.4% 1.1% 26.80 11.06 Type: 15.74 26.84 0.36% 0.04 Hard & Durable Dispersion Time: Test Date(s): 9/14-21/12 Sample Date: Hydrometer: Elevation: Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) Dry Wt. (C-A) 33.50 17.50 Moisture Content 38.50 8.00 6.50 3.50 2.000.50 Wet Wt. + A Dry Wt. + A Tare Wt. Tare# × Composite Correction 6/25/2012 Angular Address: Corrections щ Ω ≺ Ü Ω Marshall Industrial Landfill No.1 - Cells 3&4 SG-8 ASTM D 422, D 2487, D 4318 NICET 117900 Control Cylinder Fly Ash Cal. Date: 331.38 100.0% Composite Correction 4.5 4.5 332.58 4.5 4.5 332.58 4.5 4.5 50.00 49.82 1.09 Sample #: Offset: Rounded Hydrometer Reading 38.0 43.0 22.0 12.5 11.0 Beaker #: 8.0 6.5 Sample Description: Gray Black Silt (ML) 5.0 'otal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp.  $(0.5^{\circ}C)$ Karen Warner 23.5 23.5 23.5 24.0 24.0 23.5 24.0 23.5 OvenTemperature Set at 60C. Correction Factor a (Table 1): × Stirring Apparatus: A Grid C1 ID No. otal Sample Oven Dried: Pan Tare Weight (grams): NA Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 30 09 2 Boring #: cocation: Pan #

S&ME, Inc. - Corporate

Technician Name

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Certification #

Kyle Baucom

1356-11-032 Phase 03 SG-8 Hydro.xls

Project Engineer

Position

Page 1 of 1

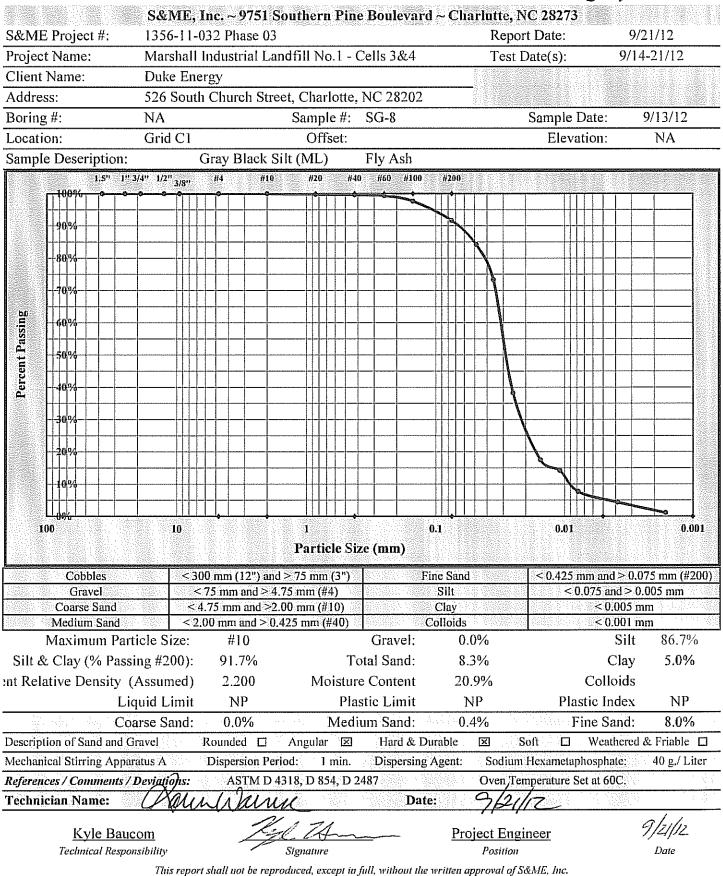
Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance



### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Another code ASTM D 4318 AASHTO T 89 П AASHTO T 90 Quality Assurance S&ME, Inc. ~9751 Southern Pine Bnuleyard, Charlotte, NC 28273 Project #: 1356-11-032 Phase 03 Report Date: 9/21/12 Project Name: Marshall Industrial Landfill No.1 Cells 3 & 4 Test Date(s) 9/14-21/12 Client Name: Duke Energy Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 9/13/12 Boring #: NA Sample #: SG-8 Grid C1 Offset: NA Elevation: NA Location: Sample Description: Black Grav Silt (ML) Fly Ash Type and Specification S&ME ID# Type and Specification S&MEID# Cal Date: Cal Date: Balance (0.01 g) 3222 6/25/2012 Grooving tool 20165 12/20/2011 20230 LL Apparatus 6/26/2012 Grooving tool Oven 10844 9/9/2012 Grooving tool Liquid Limit Plastic Limit Pan # Tare #: Tare Weight Α Wet Soil Weight + A В  $\mathbf{C}$ Dry Soil Weight + A D Water Weight (B-C) Dry Soil Weight (C-A) Ε % Moisture (D/E)\*100 F N # OF DROPS Moisture Contents determined by ASTM D 2216  $\mathbf{L}\mathbf{L}$ LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 Factor Factor 60.0 20 0.974 26 1.005 0,979 27 1,009 21 55.0 % Moisture Content 28 22 0.985 1.014 50.0 23 0.99 29 1.018 45.0 24 0,995 30 1,022 1.000 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 10 100 15 20 35 40 25 30 # of Drops Multipoint Method 1 One-point Method Dry Preparation 1 Air Dried 7 Estimate the % Retained on the #40 Sieve: Wet Preparation Nates / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technician Name Technical Responsibility

### Form No. TR-D698-2

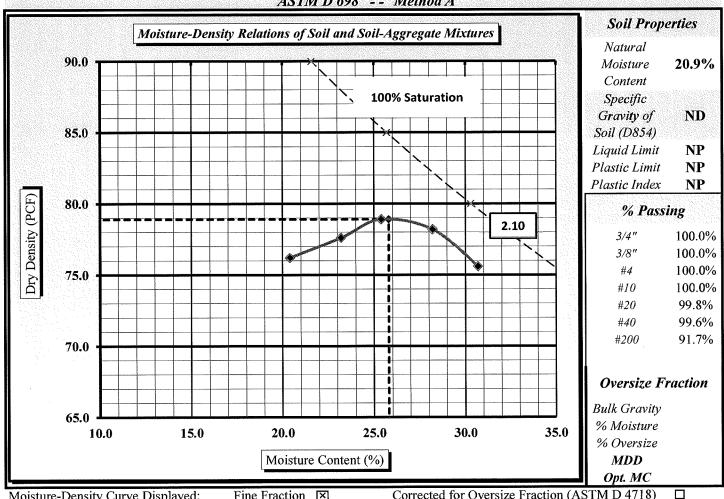
Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



S&ME Project #:	1356-11-032	Phas	se 03	Report Date:	10/10/12
Project Name:	Marshall Industrial	Landfill No. 1 - Ce	lls 3 & 4	Test Date(s):	10/4-10/12
Client Name:	Duke Energy				
Client Address:	526 South Church S	Street, Charlotte, N	C 28202	E	
Boring #: N	I	Sample #:	SG-8	Sample Date:	9/13/2012
Location: G	rid C1	Offset:	NI	Depth:	NI
Sample Description	Gray Black Silt	t (ML)			-



Corrected for Oversize Fraction (ASTM D 4718) Fine Fraction 🗵 Moisture-Density Curve Displayed: #4 Sieve ⊠ 3/4 inch Sieve □ 3/8 inch Sieve □ Sieve Size used to separate the Oversize Fraction: Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation 🗵 NI = Information not provided. ND = Not determined. References / Comments / Deviations: Jennifer Olsen Jenny: 204er Date: 10/10/12 Technician Name: Kyle Baucom

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Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	1356-11-032		Phase		Report D		10/10/12
Project Name:	Marshall Industrial	Landfill No.	1 - Cells 3 &	4	Test Dat	te(s) 1	0/4-10/12
Client Name:	Duke Energy						
Client Address:	526 South Church S	Street, Charlo	tte, NC 28202	2			
Boring #:	NI	Sar	nple #:	SG-8	Sample L	Date:	9/13/2012
Location:	Grid C1	О	ffset:	NI	De	epth:	NI
Sample Descriptio		k Silt (ML)				ATTENNESS NAME OF THE PARTY OF	
Type and Specificati				e and Specificat		ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2	Market and the Section of the Control of the Section of the Sectio	paction Mold		20231	1/6/2012
Balance	22182	6/8/2	NAME OF TAXABLE PROPERTY.	paction Hamme		20222	6/6/2012
Straightedge	20179	8/7/2		n		22151	7/13/2012
Sieve	22100	10/1/		4 B 13	11111	OL-J.	
Water Content			P 2 Balance (0	.1 gram Readab ASTM D4959		Check:	D4643 □
ASTM D2216	Water Added:	FO T265 □ 400	350	300	250	200	Natura
	Tare #:	AMRL	99	6910	JC	5C	ratura
A. Tare Weight	A.	163.7	158.8	156.4	164.5	156.8	
B. Wet Wt + Tare	Vi. 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4 (2004 4	897.8	925.9	1010.3	1077.2	973.7	
	1000 400 1000 400 400 400	725.4	757.2	837.1	905.3	835.1	
C. Dry Wt. + Tare	B-C	172.4	168.7	173.2	171.9	138.6	
D. Water Weight	State of the second	561.7	598.4	680.7	740.8	678.3	
E. Dry Weight	C-A		···			20.4%	
F. Moisture Cont		30.7%	28.2%	25.4%	23.2%		
Compaction Data ASTM D558 □ Method A ⊠	ASTM D 698 Method B	⊠ AS' □ Method	ГМ DI557 □ С □		T99 🗆 STM 1978) 🗖	AASH	SHTO T180 TO Method D
G. Wt of Soil + M		.5729	5749	5731	5680	5622	
H. Wt. of Mold	H.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g. o		1490	1510	1492	1441	1383	
J. Wt of Soil (Lbs		3.285	3.329	3.289	3.177	3.049	
K. Mold Volume	Factor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (Po	CF) J*K	98.8	100.2	99.0	95.6	91.7	
M. Dry Density (	PCF) L/(1+F)	75.6	78.2	78.9	77.6	76.2	
	arate the Oversize Fract		#4 Sieve	図 Moist Prep	3/8 inch Sieve aration □		3/4 inch Sieve eparation
Sieve Size used to sep Mechanical Ramm References / Commen			not provided N	ND = Not determi	ned		

Jennifer Olsen Technician Name

Technical Responsibility

NICET / 117926 Certification Type/No.

10/10/2012 Date

Kyle Baucom

10/16/12 Date

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision Date: 02/22/08 ASTM D 2216  $\checkmark$ AASHTO T 265 Quality Assurance S&ME, Inc. ~ 9751 Southern Pine Bouleyard ~ Charlotte, NC 28273 Project #: 1356-11-32 Phase 03 Report Date: 10/11/12 Project Name: Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s): 10/2-11/12 Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample by: Jimmy Addis 9/21/12 Sample Date(s): Sampling Method: NA NA Drill Rig: Balance ID. Method: B (0.1%) 7 3222 Calibration Date: 6/25/12 A (1%) N Sample Sample Tare Wt.+ Tare Wt. + Boring Water Percent Tare# Tare Weight 0 No. No. Depth Wet Wt Dry Wt Weight Moisture ft. or m. grams % grams grams grams e NA SG-9 NA CT 112.11 424.94 376.19 48.75 18.5% Notes / Deviations / References Location: Grid D3 Oven Temperature Set at 60C No jar sample for moisture. ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass Karen Warner NICET 117900 Technician Name Certification Type / No. Kyle Baucom Project Engineer Technical Responsibility Position

### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07

	S	8	V		
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X AASHTO T 90 AASHTO T 89 **Quality Assurance** Another code ASTM D 4318 S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 10/12/12 Report Date: 1356-11-032 Phase 03 Project #: 10/2-12/12 Marshall Industrial Landfill No.1- Cells 3&4 Test Date(s) Project Name: Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample #: SG-9 Sample Date: 9/21/12 Boring #: NA Elevation: NA Grid D3 Offset: NA Location: Sample Description: Black Gray Silt (ML) Type and Specification S&ME ID # Cal Date: S&ME ID # Cal Date: Type and Specification 3222 6/25/2012 Grooving tool 20165 12/20/2012 Balance (0.01 g) Grooving tool 20230 6/26/2012 LL Apparatus Grooving tool 10844 9/9/2012 Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight Α Wet Soil Weight + A В Dry Soil Weight + A C Water Weight (B-C) D Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F # OF DROPS N Moisture Contents determined by ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 Factor N **Factor** N 1.005 20 0.974 26 60.0 0.979 27 1.009 21 55.0 % Moisture Content 0.985 28 1.014 22 50.0 0.99 29 1.018 23 24 0.995 1.022 45.0 1.000 25 40.0  $\boxtimes$ NP, Non-Plastic 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index Group Symbol 20.0 ML100 10 15 20 25 30 35 40 # of Drops 1 Multipoint Method One-point Method 1 7 Estimate the % Retained on the #40 Sieve: **Dry Preparation** Air Dried Wet Preparation Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Kyle Baucom Karen Warner Technical Responsibility Technician Name

## Form No. TR-D422-2

## Particle Size Analysis of Soils

**♦**S&ME

Revision Date: 02/20/08 Revision No. 0

**ASTM D 422** 

S&ME, Inc.  $\sim 9751$  Southern Pine Boulevard  $\sim$  Charlotte, NC 28273

Project #:	1356-11-032 Phase 03	s 03			Report Date:	Date: 10/15/12	5/12					
Project Name:	Marshall Industrial Landfill No. 1 Cells 3 & 4	Landfill No	. 1 Cells		Test Date(s):		10/2-15/12					
Client Name:	Duke Energy			Address:	526 Sc	outh Church	526 South Church Street, Charlotte, NC	lotte, NC	Sieve	Retained Wt.	Percent Passing	assing
Boring #:	NA	Sample #:		SG-9		Sample Date:	Date:	9/21/12	3.0"	0.0	Don #	100.0%
Location:	Grid D3	JO Offi	Offset:	NA		Elevε	Elevation:	NA	1.5"	0.0	rall# (wached)	100.0%
Sample Description:	ion: Black Gray Silt (ML	lt (ML)							1.0"	0.0	(washed)	100.0%
Pan #:		Beaker #:		App	arent Re	lative Densit	Apparent Relative Density (Assumed)	2.200	3/4"	0.0		100.0%
Hydrometer Jar #:									1/2"	0.0		100.0%
Pan Tare Weight (grams):	grams):			Ž	Moisture Content	ontent	Hygroscopic	Natural	3/8"	0.0	Soil Mortar	100.0%
Total Sample Air I	Fotal Sample Air Dried Wt. + tare wt. (grams):	rams):	259.44		Tar	Tare #	66	CT	#4	0.0	SUII IVIUI IAII	100.0%
Weight of Total Sample Air Dried:	ımple Air Dried:		259.44	A	Tare	Tare Wt.	16.87	112.11	#10	00.0	100.0%	100.0%
Weight of Air Drie	Weight of Air Dried Hydrometer Sample (g):	(g):	50.00	В	Wet W	Wet Wt. + A	27.38	424.94	#20	0.01	100.0%	100.0%
Total Sample Oven Dried:	1 Dried:		233.27	Ú	Dry Wt. + A	/t. + A	26.32	376.19	#40	0.07	%8.66	%8.66
Hydrometer Sample Oven Dried	le Oven Dried (W):		44.96	Ω	Water Wt.	t. (B-C)	1.06	48.75	09#	0.34	99.2%	99.2%
% Passing #10:			100.0%	田	Dry Wt.	(C-A)	9.45	264.08	#100	1.32	97.1%	97.1%
Correction Factor a (Table 1):	a (Table 1):		1.09	% Mc	isture (1	% Moisture (100 x D/E)	11.22%	18.5%	#200	4.05	91.0%	91.0%
Description of San	Description of Sand & Gravel Particles	Rounded		Angular	×	Hard & Durable		⊠ Soft	ft o	Weathered & Friable	Friable 🗆	
Stirring Apparatus:	ratus: A 🗵			)		Dispersion Time:		l min. S	Sodium Hex	Sodium Hexametaphosphate:	te: 40 g./ Liter	j.
Balance:	.δ		Cal. Date:	6/25/2012	12	Hydrometer:	neter: ID No.		3921	Cal. Date:		
Control Cylinder	×	Composite Correction	orrection				Type:	151H		152H	×	
,	{			Corrections	1	T. J. C. C. C. C. C. C.	Per	Percent Passing		Effective	Table 3	Diameter
Time	l emp.	Hydrometer	Control	I Composite	Π	Нуаготетет	P(-#10) =	P (t	P (total) =	Depth	1,4015.0	= O
T (Min.)	(O, 5°O)	Reading	Cylinder		ction	R	$(R \times a/W) \times 100$		P x % Passing #10	L	K	$K \times ((L/T)^{1/2})$
2	23.5	39.0	5.0			34.00	82.4%	78	82.4%	10.7	0.01535	0.03553
5	23.5	28.5	5.0			23.50	57.0%	57	57.0%	12.4	0.01535	0.02421
15	23.5	19.5	5.0			14.50	35.2%	3.	35.2%	13.9	0.01535	0.01478
30	23.5	15.0	5.0			10.00	24.2%	77	24.2%	14.7	0.01535	0.01073
09	23.5	12.5	5.0			7.50	18.2%	18	18.2%	15.1	0.01535	0.00769
250	23.5	8.5	5.0			3.50	8.5%	8	8.5%	15.7	0.01535	0.00385
1440	22.5	6.0	4.5			1.50	3.6%	3	3.6%	16.0	0.01553	0.00164
						#VALUE!	#VALUE		3.6%	#VALUE!	#N/A	#N/A
References / Comments / Deviations		ASTM D 422, D 2487, D 4318	3 2487, D 4	318								
Oven Temperature Set at 60C.	re Set at 60C.											
<b>X</b>	Karen Warner	)IX	NICET 117900	00€		Kyle Baucom	Щ		Projec	Project Engineer	,	10/16/12
L	Technician Name	)	Certification#	#	Te	Technical Responsibility	ibility		I I	Position		Date

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

1356-22-032 Phase 03 SG-9 Hydro.xls

Page 1 of 1

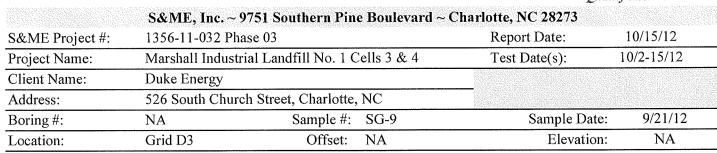
Revision Date: 02/20/08

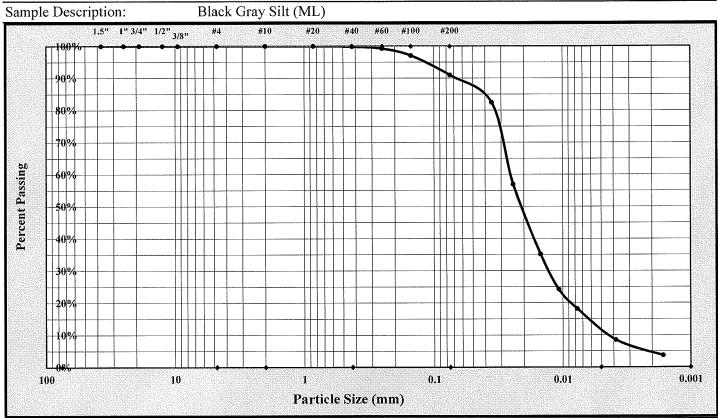
### Particle Size Analysis of Soils



ASTM D422

Quality Assurance





Cobbles	< 300  mm  (12")  and  > 7	75 mm (3")	Fine Sand	< 0.425  mm and > 0.07	75 mm (#200)
Gravel	< 75 mm and > 4.75	mm (#4)	Silt	< 0.075  and > 0.0	005 mm
Coarse Sand	< 4.75 mm and >2.00	mm (#10)	Clay	< 0.005 m	n
Medium Sand	< 2.00 mm and > 0.425	mm (#40)	Colloids	< 0.001 mi	m
Maximum Particle Siz	ze: #20	Gravel:	0.0%	Silt	79.5%
Silt & Clay (% Passing #20	00): 91.0%	Total Sand:	9.0%	Clay	11.5%

91.0%	Tota	al Sand:	9.0%			Clay	11.5%
2.200	Moisture	Content	18.5%			Colloids	
NP	Plast	ic Limit	NP		Plas	stic Index	NP
0.0%	Mediu	m Sand:	0.2%		F	ine Sand:	8.9%
Rounded 🗆	Angular ⊠	Hard & Durab	le 🗵	Soft		Weathered &	& Friable 🛚
Dispersion Per	iod: 1 min.	Dispersing Age	nt: Soc	lium Hexa	ametap	hosphate:	40 g./ Liter
	2.200 NP 0.0% Rounded □	2.200 Moisture NP Plast 0.0% Medium Rounded □ Angular ⊠	2.200 Moisture Content  NP Plastic Limit  0.0% Medium Sand:  Rounded □ Angular ☒ Hard & Durab	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2.200Moisture Content18.5%NPPlastic LimitNP0.0%Medium Sand:0.2%Rounded□Angular□Hard & Durable□Soft	2.200Moisture Content18.5%NPPlastic LimitNPPlast0.0%Medium Sand:0.2%FRounded □Angular ☒Hard & Durable ☒Soft □	2.200       Moisture Content       18.5%       Colloids         NP       Plastic Limit       NP       Plastic Index         0.0%       Medium Sand:       0.2%       Fine Sand:         Rounded □       Angular ☒       Hard & Durable ☒       Soft □       Weathered &

References / Comments / Déviations: A ASTM D 4318, D 854, D 2487

Signature

Technician Name: Xallul Jallul Kyle Baucom

Kyle Baucom

Kyle Baucom

Project Engineer

Position

|\display||5||12 | Date

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Date:

Technical Responsibility

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

						<u></u>	
	•	~ 9751 South		ulevard~Char	ONE DESCRIPTION OF STREET		
· · · · · · · · · · · · · · · · · · ·	356-11-032		Phase		Report D		11/2/12
3	Aarshall Industrial	Landfill No.	1 - Cells 3 &	4	Test Dat	e(s) 1	0/2-11/2/12
	Ouke Energy						
Client Address: 5	26 South Church S	Street, Charlo	otte, NC 2820	2			
Boring #: N	VA	Sa	mple #:	SG-9	Sample D		9/2/2012
	Grid D3		Offset:	NA	De	pth:	NA
Sample Description		y Silt (ML)					
Type and Specificatio			진 사람들이 되었다. 하는 어떻게 하였다.	e and Specif <b>ic</b> ati		ME ID #	Cal Date:
Balance (0.1 g)	22182			paction Mold	A CARLON CONTRACTOR	20231	1/6/2012
Balance	22182			npaction Hamme	arte engles dan marin ar	20222	6/6/2012
Straightedge	20179		2012 Ove	n		10844	5/9/2012
Sieve	22100		/2012	N 1 D 4-1	31223	Chaste	
Water Content			or 2 Balance (U	1.1 gram Readab		Check:	1 D4643 □
ASTM D2216 [		ГО Т265 □		ASTM D4959	L	ASTIV	1 174043 II
	Water Added:	CD.	PFM	79	L-18	85	
	Tare #:	SR	0.5000000000000000000000000000000000000	7 22512 1970414286515451544111141346	87.7	74.4	
A. Tare Weight	A,	165.1	166.8	72.6			
B. Wet Wt + Tare V	166650000000000000000000000000000000000	1142.4	1136.7	944.1	828.3	989.1	
C. Dry Wt. + Tare	Wt. C.	959.9	938.9	753.9	703.8	773.2	
D. Water Weight	B-C	182.5	197.8	190.2	124.5	215.9	
E B 377 1 14							
E. Dry Weight	C-A	794.8	772.1	681.3	616.1	698.8	
E. Dry Weight  F. Moisture Conte	ent 100*D/E	23.0%	25.6%	27.9%	20.2%	30.9%	
F. Moisture Conte Compaction Data ASTM D558 ☐ Method A ⊠	Requires a ASTM D 698 Method B	23.0% GP 5 Balance 区 AS □ Method	25.6% for ASTM (1) TM D1557	27.9% gram or .0022 L AASHTO Method D (A	20.2% b. readability). 1799 □ STM 1978) □	30.9% Check: AA AASI	SHTO T180
F. Moisture Conte Compaction Data ASTM D558 ☐ Method A ⊠	Requires a ASTM D 698 Method B	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557	27.9% gram or .0022 L AASHTO Method D (A	20.2% b. readability). 0.799	30.9% Check: AA AASI 5746	SHTO T180
F. Moisture Conte Compaction Data ASTM D558 ☐ Method A ☒ G. Wt of Soil + Mo H. Wt. of Mold	Requires a ASTM D 698 Method B old G. H.	23.0% GP 5 Balance 区 AS □ Method	25.6% for ASTM (1) TM D1557	27.9% gram or .0022 L	20.2% b. readability). 0 T99	30.9% Check: AA AASI 5746 4239	SHTO T180
F. Moisture Conte Compaction Data ASTM D558 Method A G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or	Requires a ASTM D 698 Method B old G. H. Ibs.) G-H	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557   IC	27.9% gram or .0022 L	20.2% b. readability). b T99	30.9% Check: AA AASH 5746 4239 1507	SHTO T180
F. Moisture Conte Compaction Data ASTM D558 Method A G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or	Requires a ASTM D 698 Method B old G. H. Ibs.) G-H	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557  1C  5768 4239	27.9% gram or .0022 L	20.2% b. readability). 0 T99	30.9% Check: AA AASI 5746 4239	SHTO T180
F. Moisture Conte Compaction Data ASTM D558  Method A  G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or J. Wt of Soil (Lbs.)	Requires a ASTM D 698 Method B old G. H. Ibs.) G-H	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557   IC	27.9% gram or .0022 L	20.2% b. readability). b T99	30.9% Check: AA AASH 5746 4239 1507	SHTO T180
F. Moisture Conte Compaction Data ASTM D558  Method A  G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or J. Wt of Soil (Lbs.) K. Mold Volume F	nt 100*D/E  Requires a  ASTM D 698  Method B  old G.  H.  Ibs.) G-H  1/453.6 or I  actor K.	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557   1C   5768  4239  1529  3.371	27.9% gram or .0022 L AASHTC Method D (A) 5764 4239 1525 3.362	20.2% b. readability). 0 T99	30.9% Check: AA AASI 5746 4239 1507 3.322	SHTO T180
F. Moisture Conte Compaction Data ASTM D558  Method A  G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or J. Wt of Soil (Lbs.) K. Mold Volume F L. Wet Density (PC	Requires a ASTM D 698 Method B old G. H. Ibs.) G-H 1/453.6 or I actor K. F) J*K	23.0% GP 5 Balance	25.6% for ASTM (1) TM D1557   1C  5768 4239 1529 3.371 30.09	27.9% gram or .0022 L	20.2% b. readability). b T99	30.9% Check: AASI 5746 4239 1507 3.322 30.09	SHTO T180
F. Moisture Conte Compaction Data ASTM D558 Method A G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or J. Wt of Soil (Lbs.) K. Mold Volume F L. Wet Density (PC	nt 100*D/E  Requires a ASTM D 698 Method B old G. H. Ibs.) G-H 1/453.6 or I actor K. F) J*K CF) L/(1+F)	23.0% GP 5 Balance S706 4239 1467 3.234 30.09 97.3 79.1	25.6% for ASTM (1) TM D1557   1C   5768 4239 1529 3.371 30.09 101.4	27.9% gram or .0022 L	20.2% b. readability). 0.799	30.9% Check: AASI 5746 4239 1507 3.322 30.09 100.0	SHTO T180 HTO Method D
F. Moisture Conte Compaction Data ASTM D558 Method A G. Wt of Soil + Mo H. Wt. of Mold I. Wt. of Soil (g. or J. Wt of Soil (Lbs.) K. Mold Volume F L. Wet Density (PC	Requires a ASTM D 698 Method B old G. H. Ibs.) G-H 1/453.6 or I actor K. F) J*K CF) L/(1+F) rate the Oversize Fract	23.0% GP 5 Balance S706 4239 1467 3.234 30.09 97.3 79.1 ion: Rammer ⊠	25.6% for ASTM (1) TM D1557	27.9% gram or .0022 L	20.2% b. readability). b T99  STM 1978)  5641  4239  1402  3.091  30.09  93.0  77.4  3/8 inch Sieve	30.9% Check: AA AASI 5746 4239 1507 3.322 30.09 100.0 76.4	SHTO T180 HTO Method D
F. Moisture Conte  Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mo  H. Wt. of Mold  I. Wt. of Soil (g. or  J. Wt of Soil (Lbs.)  K. Mold Volume F  L. Wet Density (PC  M. Dry Density (PC  Sieve Size used to sepa	ent 100*D/E  Requires a  ASTM D 698  Method B  old G.  H.  lbs.) G-H  1/453.6 or I  actor K.  F) J*K  CF) L/(1+F)  rate the Oversize Fract  Manual F	23.0% GP 5 Balance S706 4239 1467 3.234 30.09 97.3 79.1 ion: Rammer ⊠	25.6% for ASTM (1) TM D1557   1C  5768 4239 1529 3.371 30.09 101.4 80.7	27.9% gram or .0022 L	20.2% b. readability). b T99  STM 1978)  5641  4239  1402  3.091  30.09  93.0  77.4  3/8 inch Sieve	30.9% Check: AA AASI 5746 4239 1507 3.322 30.09 100.0 76.4	SHTO T180 HTO Method D  3/4 inch Sieve

Kyle Baucom

Technical Responsibility

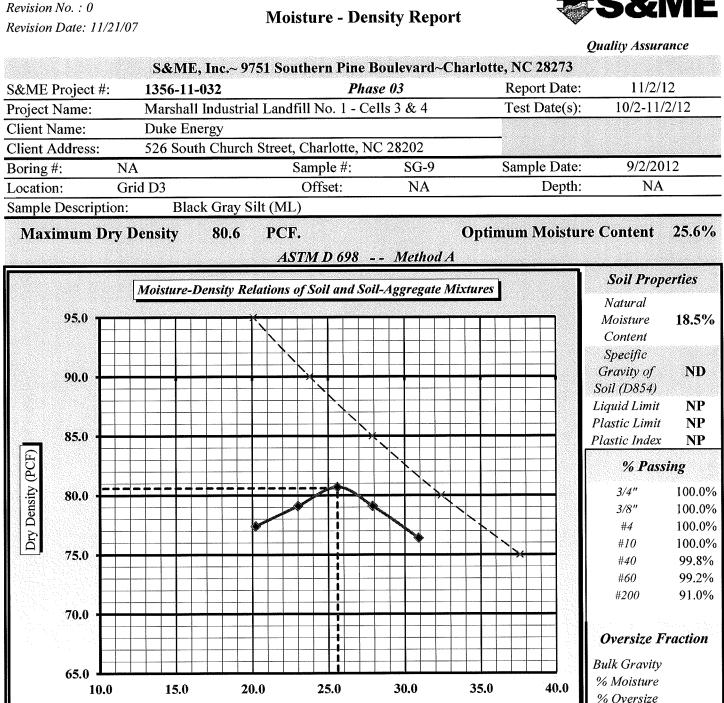
**Project Engineer** 

Position

Signature

### Form No. TR-D698-2





Moisture-Density Curve Displayed: Sieve Size used to separate the Oversize Fraction:

Fine Fraction 🗵

Corrected for Oversize Fraction (ASTM D 4718)

Mechanical Rammer  Manual Rammer ⊠

3/8 inch Sieve □ Moist Preparation □

3/4 inch Sieve □ Dry Preparation 🗵

**MDD** Opt. MC

References / Comments / Deviations:

ASTM D 854: Specific Gravity of Soils

Signåture

Moisture Content (%)

Technician Name:

Jennifer Olsen

Date: 11/2/12

Kyle Baucom

Technical Responsibility

**Project Engineer** 

Position

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#4 Sieve ⊠

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision I	Date: 02/22/08		STM D 22	16 🗸	AASHTO T 2	265 🗆	Que	lity Assurance	
				70				my Assurance	
Project #	#: 1350	6-11-032 Ph				Report D		10/15/12	
Project N		shall Industri	al Landfil	l No. 1 - Cells	3 & 4	Test Date	e(s): 1	0/11-15/12	
Client Na	ame: Duke	e Energy							
Client A	ddress: 526	South Churcl	n Street, C	Charlotte, NC 2	28202				
Sample b	oy: Jimn	ny Addis				Sample Date		10/8/12	
	g Method:	NA				Drill I		NA	EEST OF
Metho	d: A (1%	<u>)                                    </u>	B (0.1	%) <u> </u>	Balance ID.	3222	Calibration D	ate: 6/25/1	
Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
		ft. or m.		grams	grams	grams	grams	%	e
NA	SG-10	NA	G-11	83.48	351.16	305.38	45.78	20.6%	
		***************************************							
									24/4/48 25/5/4
								1	
									743,75
	· · · · · · · · · · · · · · · · · · ·								
Mark (T	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1								
	viations / Referen		was taken t	from the bottom	of the bucket				
	nperature Set at		vas takon i	Tom the bottom	of the outlet.	***************************************			
Location:			•						
ASTM D	2216: Laborato	ry Determinat	ion of Wat	er (Moisture) Co	ontent of Soil a	nd Rock by Mas	SS		
	Karen Warr Technician Na		Pa	UMUJAV Signature	un	NICET 117 Certification Type		[0][7][ Date	R
	Kyle Bauco Technical Respons		Tyl	Signature		Project Engi	neer	10/18/12 Date	_
		This report sh	all not be rep	roduced, except in	full, without the wi	ritten approval of S	&ME, Inc.		



Form No. TR-D4318-T89-90 Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 X AASHTO T 89 AASHTO T 90 **Ouality Assurance** ASTM D 4318 Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 10/17/12 1356-11-032 Phase 03 Report Date: Project #: 10/11-17/12 Marshall Industrial Landfill No.1- Cells 3&4 Test Date(s) **Project Name:** Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 10/8/12 Sample #: SG-10 Boring #: NA Elevation: NA Offset: NA Grid C4 Location: Black Gray Silt (ML) Fly Ash Sample Description: Type and Specification S&ME ID# Cal Date: S&ME ID # Type and Specification Cal Date: 12/20/2011 20165 3222 6/25/2012 Grooving tool Balance (0.01 g) 20230 6/26/2012 Grooving tool LL Apparatus 9/9/2012 Grooving tool Oven 10844 Liquid Limit Plastic Limit Pan# Tare #: Tare Weight A Wet Soil Weight + A В Dry Soil Weight + A  $\mathbf{C}$ D Water Weight (B-C) Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F # OF DROPS N Moisture Contents determined by ASTM D 2216 LL LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 Factor N **Factor**  $\mathbf{N}$ 26 60.0 0.974 1.005 20 21 0.979 27 1.009 55.0 % Moisture Content 22 0.985 28 1.014 50.0 0.99 1.018 23 29 0.995 30 1.022 45.0 24 1.000 40.0 NP, Non-Plastic X 35.0 **Liquid Limit** 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method Estimate the % Retained on the #40 Sieve: [7] Wet Preparation **Dry Preparation** 1 Air Dried Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name



Kyle Baucom Technical Responsibility

### Form No. TR-D422-2

Revision No. 0

## Particle Size Analysis of Soils

**S&ME** 

Revision Date: 02/20/08

ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

 $\overline{K} \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 100.0%0.00164 100.0% 100.0% 100.0% %6.66 %9.66 0.00780 0.0038800.001%0.66 %9.68 Diameter 0.04909 0.01509 0.01091 %8.96 0.03581 0.02437 **=** 16/18/12 Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar (washed) 100.0% %6.66 %9.66 %0.66 %8.96 %9.68 0.01535 0.01535 0.01535 0.01535 Table 3 0.01535 0.01535 0.01535 0.01553 Pan# Weathered & Friable × Cal. Date: Retained Wt. 152H Effective Project Engineer Depth 0.50 10.9 12.6 16.0 16.0 15.5 0.0 0.0 0.01 0.04 0.17 1.54 4.97 10.2 14.5 15.1 0.0 0.0 0.0 0.0 Sieve #100 Px % Passing #10 #200 ..8/8 3/4" 1/2" 09# 1.0" #10 #20 #40 #4 P (total) = 75.3% 51.3% 25.1% 16.0% 84.4% 11.4% 4.6% 3901 3.4% Soft Percent Passing 151H 526 South Church Street, Charlotte, NC 28202 351.16 305.38 221.90 20.6% Natural 83.48 45.78 2.200 G-11 10/8/12 Ä 1 min. (Rxa/W)x100 ID No. × Apparent Relative Density (Assumed) P(-#10)= Hygroscopic 84.4% 75.3% 51.3% 25.1% 16.0% 11.4% 4.6% 3.4% 4.66% 12.46 23.40 10.94 L-10 23.91 0.51 10/11-17/12 Hard & Durable Dispersion Time: Sample Date: Hydrometer: Elevation: Report Date: 10/17/12 Kyle Baucom Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) Dry Wt. (C-A) 37.00 33.00 22.50 11.00 5.00 7.00 2.00 1.50 Moisture Content Wet Wt. + A Dry Wt. + A Test Date(s): Tare Wt. Tare# × Composite Correction 6/25/2012 Address: Angular Corrections ш B Ö ⋖ SG-10 Marshall Industrial Landfill No. 1 - Cells 3&4 NA ASTM D 422, D 2487, D 4318 NICET 117900 Control Cylinder Cal. Date: 5.0 5.0 5.0 5.0 5.0 5.0 Composite Correction 4 00.00 5.0 343.38 328.09 343.38 50.00 47.77 1.09 Fly Ash Sample #: Offset: Rounded Hydrometer Reading 38.0 27.5 16.0 12.0 10.0 42.0 7.0 Sample Description: Black Gray Silt (ML) Beaker #: Fotal Sample Air Dried Wt. + tare wt. (grams): 1356-11-032 Phase 03 Weight of Air Dried Hydrometer Sample (g): 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Oven Temperature was set at 60C. Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations (0.5 °C) Temp. 23.5 23.5 23.5 23.5 23.5 23.5 23.5 Karen Warner 22.5 Correction Factor a (Table 1): Grid C4 ID No. Total Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: NA Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: T (Min.) Time 1440 250 15 30 9 S Project #: Boring #: ocation: 2 Pan #:

S&ME, Inc. - Corporate

Technician Name

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Certification #

1356-11-032 Phase 03 SG-10 Hydro.xls Page 1 of 1

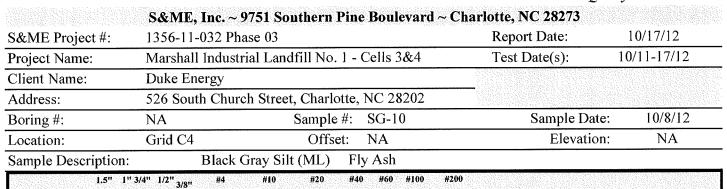
Revision Date: 02/20/08

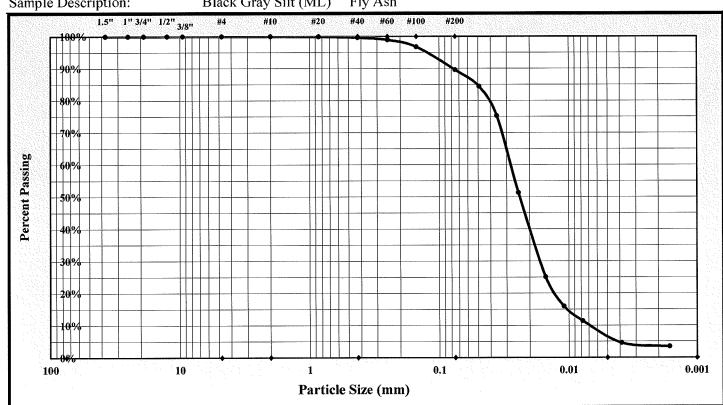
### Particle Size Analysis of Soils



ASTM D422

Quality Assurance





Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm
7.4 · D / 1	C: //10	C1 0.00/	C:14 92 16/

Maximum Particle Size:	#10		Gravel:	0.0%		Silt	83.1%
Silt & Clay (% Passing #200):	89.6%	Tot	tal Sand:	10.4%		Clay	6.5%
ent Relative Density (Assumed)	2.200	Moisture	Content	20.6%		Colloids	
Liquid Limit	NP	Plas	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.0%	Mediu	ım Sand:	0.4%		Fine Sand:	10.0%
Description of Sand and Gravel	Rounded	Angular ⊠	Hard & Durab	le 🗵	Soft	□ Weathered	& Friable □
Mechanical Stirring Apparatus A	Dispersion Per	riod: 1 min.	Dispersing Age	nt: So	dium Hexa	ametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Sully James Date: 10/17/17

Kyle Baucom
Technical Responsibility

Signature

Project Engineer

Position

]&]]&/]<sub>2</sub> Date

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	5-11-032		Phase		Report D		11/2/12
Project Name: Mar	shall Industrial	Landfill No.	1 - Cells 3 &	4	Test Dat	e(s) 10	)/11-11/2/12
	e Energy						
Client Address: 526	South Church S						
Boring #: NA			mple #:	SG-10	Sample D		10/8/2012
Location: Grid			Offset:	NA	De	pth:	NA
Sample Description:		y Silt (ML)					
Type and Specification	S&ME ID			and Specificati		ME ID #	Cal Date:
Balance (0.1 g)	22182			paction Mold paction Hamme		20231 20222	1/6/2012 6/6/2012
Balance	22182 20179	Control of the contro	2012 Com 2012 Over		Anna and a second a	10844	5/9/2012
Straightedge Sieve	20179		/2012 Over	u		10044	3/9/2012
Water Content			3P 2 Balance (0	J gram Readah	ility).	Check:	
ASTM D2216 ⊠		O T265 □	J. Z Datanec (0	ASTM D4959			1 D4643 □
	Water Added:						
	Tare #:	CJ	691	5 <b>I</b>	G	KO	
A. Tare Weight	Α.	157.6	157.2	162.7	158.8	167.5	
B. Wet Wt + Tare Wt	В.	1116.2	1000.7	1027.7	1026.9	1102.6	
C. Dry Wt. + Tare Wt.	C.	924.1	818.5	867.3	880.0	884.7	
D. Water Weight	B-C	192.1	182.2	160.4	146.9	217.9	
E. Dry Weight	C-A	766.5	661.3	704.6	721.2	717.2	
F. Moisture Content	100*D/E	25.1%	27.6%	22.8%	20.4%	30.4%	
Compaction Data ASTM D558 □ Method A ⊠	Requires a ASTM D 698 Method B	⊠ AS	e for ASTM (1 g STM D1557       1 C	AASHTO			SHTO T180 ITO Method D
G. Wt of Soil + Mold	G.	5761	5763	5704	5657	5742	
H. Wt. of Mold	H.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g. or lbs	.) G-H	1522	1524	1465	1418	1503	
J. Wt of Soil (Lbs.)	I/453.6 or 1	3.355	3.360	3.230	3.126	3.313	
K. Mold Volume Facto	or K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	101.0	101.1	97.2	94.1	99.7	
M. Dry Density (PCF)	L/(1+F)	80.7	79.2	79.2	78.2	76.5	
Sieve Size used to separate Mechanical Rammer References / Comments / L	☐ Manual F	lammer 🗵	#4 Sieve	Moist Prep	3/8 inch Sieve aration □		3/4 inch Sieve eparation
Oven Temperature Set at 60							

Jennifer Olsen Technician Name

Technical Responsibility

NICET 117926 Certification Type/No. 11/2/2012

Kyle Baucom

Project Engineer

Position

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



Quality Assurance

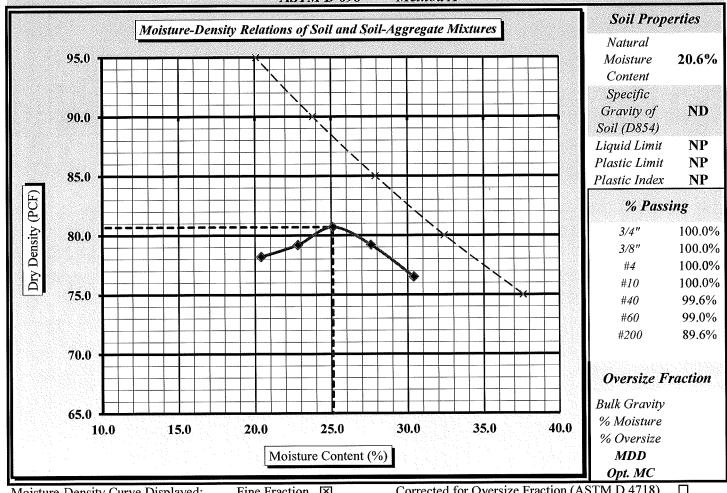
	S&ME, Inc.~ 97	51 Southern Pine	Boulevard~Cha	rlotte, NC 28273	
S&ME Project #:			se 03	Report Date:	11/2/12
Project Name:	Marshall Industria	l Landfill No. 1 - Co	ells 3 & 4	Test Date(s):	10/11-11/2/12
Client Name:	Duke Energy				
Client Address:	526 South Church	Street, Charlotte, N	C 28202		
Boring #:	NA	Sample #:	SG-10	Sample Date:	10/8/2012
Location:	Grid C4	Offset:	NA	Depth:	NA

Sample Description: Black Gray Silt (ML)

Maximum Dry Density 80.7 PCF.

Optimum Moisture Content 25.1%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction ⊠ Corrected for Oversize Fraction (ASTM D 4718) □
Sieve Size used to separate the Oversize Fraction: #4 Sieve ⊠ 3/8 inch Sieve □ 3/4 inch Sieve □
Mechanical Rammer □ Manual Rammer ⊠ Moist Preparation □ Dry Preparation ⊠

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Technician Name: Jennifer Olsen Date: 11/2/12

Kyle Baucom
Technical Responsibility

Signature

Project Engineer
Position

//5/<u>//</u> Date

### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 AASHTO T 90 ASTM D 4318  $\times$ AASHTO T 89 **Ouality Assurance** Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 11/26/12 Report Date: 1356-11-032 Phase 03 Project #: 11/6-26/12 Marshall Industrail Landfill No.1 - Cells 3&4 Test Date(s) Project Name: Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC 28202 Client Address: Sample #: SG-11 Sample Date: 11/2/12 Boring #: NA Offset: NA Elevation: NA Grid D2 Location: Sample Description: Black Gray Silt (ML) Fly Ash S&ME ID# Cal Date: Type and Specification S&ME ID # Cal Date: Type and Specification 20837 10/29/2012 6/25/2012 Grooving tool 3222 Balance (0.01 g) 5/21/1955 6/26/2012 Grooving tool LL Apparatus 10844 9/4/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight Α Wet Soil Weight + A В Dry Soil Weight + A C Water Weight (B-C) D E Dry Soil Weight (C-A) % Moisture (D/E)\*100 F # OF DROPS Moisture Contents determined N by ASTM D 2216 LL LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 Factor N Factor N 60.0 20 0.974 26 1.005 1.009 21 0.979 27 55.0 % Moisture Content 1.014 22 0.985 28 50.0 23 0.99 29 1.018 0.995 30 1.022 45.0 1.000 25 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method Estimate the % Retained on the #40 Sieve: 1 Air Dried **Dry Preparation** Wet Preparation Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technical Responsibility Technician Name This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

### Form No. TR-D422-2 Revision No. 0

## Particle Size Analysis of Soils

**♦S&ME** 

Revision Date: 02/20/08

1356-11-032 Phase 03

Project #:

*ASTM D 422* 

## S&ME, Inc. $\sim 9751$ Southern Pine Boulevard $\sim$ Charlotte, NC 28273 Report Date: 11/26/12

Project Name:	Marshall Industrial Landfill No.1 - Cells 3&4	rial Landfill	No.1 - Cells 3		Test Date(s):		11/6-15/12					
	Duke Energy		7	Address:	526 So	uth Church S	526 South Church Street, Charlotte. NC 28202	NC 28202	Sieve	Retained Wt.	Percent Passing	Passing
Boring #:	NA	Sar	Sample #: SC	SG-11		Sample Date:	Date:	11/2/12	3.0"	0.0	Don #	100.0%
	Grid D2		Offset: NA			Eleva	Elevation:	NA	1.5"	0.0	ralin (xvached)	100.0%
Sample Description:	on: Black Gray Silt (ML)	y Silt (ML)	Fly Ask	Ash					1.0"	0.0	(washed)	100.0%
Pan #:		Beaker #:		App	arent Re	lative Densit	Apparent Relative Density (Assumed)	2.200	3/4"	0.0		100.0%
Hydrometer Jar #:									1/2"	0.0		100.0%
Pan Tare Weight (grams):	rams):			M	Moisture Content	ontent	Hygroscopic	Natural	3/8"	0.0	Soil Mortor	100.0%
Total Sample Air Dried Wt. + tare wt. (grams):	ried Wt. + tare w	t. (grams):	292.33		Tar	Tare #	2	၁	#4	0.0	OUL MULAL	100.0%
Weight of Total Sample Air Dried:	nple Air Dried:		292.33	Ą	Tare Wt.	Wt.	15.79	16.52	#10	0.26	100.0%	%6.66
Weight of Air Dried Hydrometer Sample (g):	1 Hydrometer Sar	nple (g):	50.00	В	Wet W	Wet Wt. + A	26.38	330.91	#20	0.03	%6.66	%6.66
Total Sample Oven Dried:	Dried:		291.50	၁	Dry Wt. +	't. + A	26.35	286.59	#40	60.0	%8'66	99.7%
Hydrometer Sample Oven Dried (W):	Oven Dried (W	V):	49.86	Ω	Water Wt.	t. (B-C)	0.03	44.32	09#	0.35	%8.66	99.2%
% Passing #10:			%6.66	Ξ	Dry Wt.	(C-A)	10.56	270.07	#100	1.17	97.7%	%9.76
Correction Factor a (Table 1):	(Table 1):		1.09	% Mc	isture (1	% Moisture (100 x D/E)	0.28%	16.4%	#200	4.68	%9.06	90.5%
Description of Sand & Gravel Particles	& Gravel Partic	les Rounded	d b	Angular	×	Hard & Durable	Durable 🗵	Soft	n n	Weathered & Friable	2 Friable	m
Stirring Apparatus:	atus: A	B				Dispersion Time:		1 min. S	sodium He	Sodium Hexametaphosphate:		ħ
Balance:	No.	3222	Cal. Date:	6/25/2012	12	Hydrometer:	neter: ID No.		3901	Cal. Date:	3/25/2012	
Control Cylinder	ra X	Composite Correction	Correction				Type:	151H		152H	×	
			Cor	Corrections	_	100	Perc	Percent Passing		Effective	Table 3	Diameter
Time	lemp.	Hydrometer	Control	Composite		нуагошегег	P(-#10)=	) P(t	P (total) =	Depth	Table	D= :
T (Min.)	(0.5 °C)	Reading	Cylinder	Correction	ction	R	(Rxa/W)x100		Px% Passing #10	$\mathbf{T}$	K	$K \times ((L/T)^{1/2}$
	22.5	42.0	5.0			37.00	%6.08	)8	%8.08	10.2	0.01553	0.04967
2	22.5	39.5	5.0			34.50	75.4%	7.	75.4%	10.6	0.01553	0.03582
5	22.5	31.5	5.0			26.50	57.9%	5.	57.9%	11.9	0.01553	0.02401
15	22.5	20.0	5.0			15.00	32.8%	33	32.8%	13.8	0.01553	0.01492
30	22.5	15.0	5.0			10.00	21.9%	2	21.8%	14.7	0.01553	0.01086
09	22.5	13.0	5.0			8.00	17.5%	,1	17.5%	15.0	0.01553	0.00776
250	22.5	9.5	5.0			4.50	%8.6	6	%8.6	15.6	0.01553	0.00387
1440	21.5	7.5	5.0			2.50	5.5%	5	5.5%	15.9	0.01571	0.00165
References / Comments / Deviations	nts / Deviations	ASTM D 422	ASTM D 422, D 2487, D 4318	8								
Oven Temperature Set At 60C.	e Set At 60C.											
Ka	Karen Warner	<i>                   </i>	NICET 117900	$\overline{c}$		Kyle Baucom	<u> </u>		Proje	Project Engineer	`	12/7/12

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

NICET 117900 Certification#

Karen Warner Technician Name

1356-11-032 Phase 03 SG-11 Hydro.xls Page 1 of 1

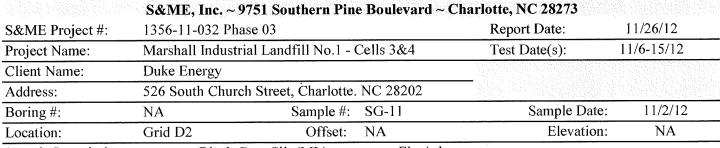
Revision Date: 02/20/08

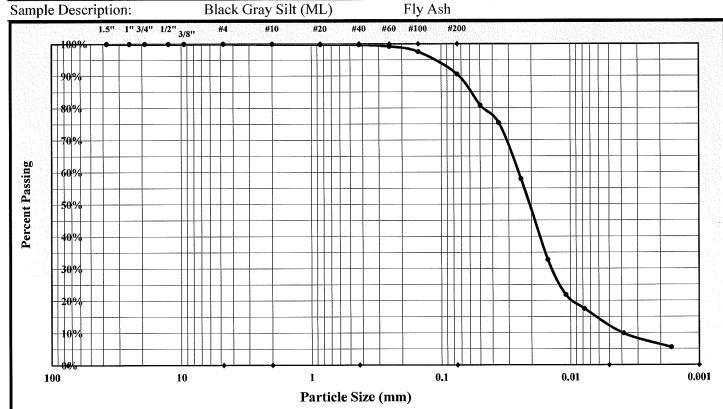
### **Particle Size Analysis of Soils**



ASTM D422

**Quality Assurance** 





Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm
Maximum Particle	Size: #10	Gravel: 0.0%	Silt 77.5%

Maximum Particle Size:	#10		Gravei:	0.0%		2111	11.370
Silt & Clay (% Passing #200):	90.5%	Tot	tal Sand:	9.5%		Clay	13.0%
ent Relative Density (Assumed)	2.200	Moisture	Content	16.4%	)	Colloids	
Liquid Limit	NP	Plas	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.1%	Mediu	ım Sand:	0.2%		Fine Sand:	9.2%
Description of Sand and Gravel	Rounded	Angular ⊠	Hard & Du	rable 🗵	Soft	☐ Weathered &	k Friable 🛚
Mechanical Stirring Apparatus A	Dispersion Per	riod: I min.	Dispersing A	Agent: S	Sodium Hexa	ametaphosphate:	40 g./ Liter

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: // June Date: ///26//7

Kyle Baucom
Technical Responsibility

M. L. Signature

Project Engineer

Position

[2]7]<sub>[2]</sub> Date

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

9	356-11-032		Phase		Report I		11/26/12
3	Aarshall Industrial	Landfill No.	. 1 - Cells 3 &	: 4	Test Da	te(s)	11/6-12/12
	Ouke Energy						
Client Address: 5	26 South Church S	Street, Charle	otte, NC 2820	)2			
Boring #: N	VI	Sa	mple #:	SG-11	Sample I	Date:	11/2/2012
	irid D2		Offset:	NI	De	epth:	NI
Sample Description		y Silt (ML)			A.,		
Type and Specificatio			성기 왕조는 이 그 생님, 이 나는 바다 다시	e and Specificati		ME ID #	Cal Date:
Balance (0.1 g)	22182	The state of the s		mpaction Mold		20231	1/6/2012
Balance	22182	The same of the state of the st		mpaction Hamme		21598	7/25/2012
Straightedge	20179		2012 Ove	en		22151	7/13/2012
Sieve #4	22100		/2012	0.1 D 1.1		Cl 1-	
Water Content		tent requires € FO T265 □	3P 2 Balance (	0.1 gram Readab ASTM D4959		Check:	M D4643 □
ASTM D2216	Water Added:	200	250	300	350	YOI	M D4043 L
	Tare #:	JRC	MAC	500 5E	DJM		
A. Tare Weight	A.	157.0	161.2	157.2	160.7		
	[ [ [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]	1045.5	101.2	1134.5	1113.0		
B. Wet Wt + Tare V						[	
C. Dry Wt. + Tare V		902.2	929.4	943.6	909.8		
D. Water Weight	B-C	143.3	168.0	190.9	203.2		
E. Dry Weight	C-A	745.2	768.2	786.4	749.1		
F. Moisture Conte		19.2%	21.9%	24.3%	27.1%		
<b>Compaction Data</b>	. =			gram or .0022 L		Check:	
ASTM D558 □	ASTM D 698		TM D1557	AASHTO			ASHTO T180
Method A 🗵	Method B				STM 1978) 🗆	AA)	SHTO Method D
G. Wt of Soil + Mo		5701	5762	5815	5793		
H. Wt. of Mold	Н.	4239	4239	4239	4239		
I. Wt. of Soil (g. or		1462	1523	1576	1554		
J. Wt of Soil (Lbs.)	I/453.6 or 1	3.223	3.358	3.474	3.426		
K. Mold Volume Fa	actor K.	30.09	30.09	30.09	30.09		
L. Wet Density (PCI	F) J*K	97.0	101.0	104.5	103.1		
M. Dry Density (PO	CF) L/(1+F)	81.4	82.9	84.1	81.1		
Sieve Size used to separ	ate the Oversize Fracti	ion:	#4 Siev		3/8 inch Sieve		3/4 inch Sieve
Mechanical Rammer			· ····	Moist Prepa		Dry	Preparation
References / Comments	/ Deviations:	VI = Informatio	n not provided.	ND = Not determin	ned.		
Kejerences/Comments							
Kejerences/Comments							
References/ Comments			******				
Jennifer	01	for 1	LOGen acture	NII	CET / 117926		11/12/2012

Kyle Baucom

Technical Responsibility

Project Engineer

Position

Date

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**

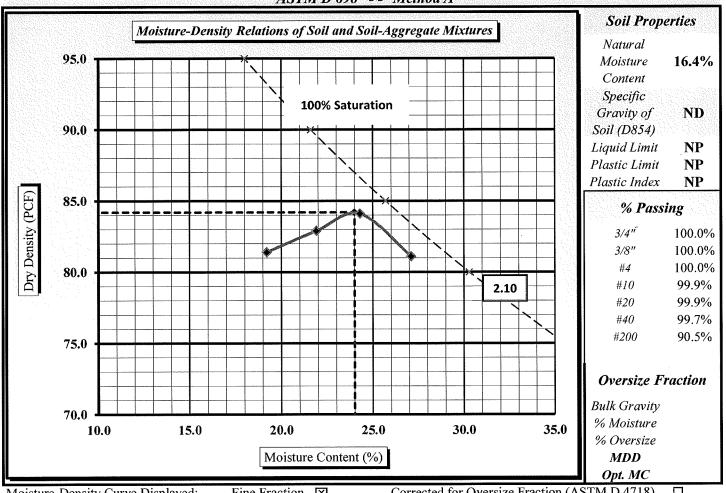


Quality Assurance

S&ME Project #:	1356-11-032	Pha	se 03	Report Date:	11/26/12
Project Name:	Marshall Industri	al Landfill No. 1 - Ce	ells 3 & 4	Test Date(s):	11/6-12/12
Client Name:	Duke Energy				
Client Address:	526 South Churcl	h Street, Charlotte, N	C 28202		
Boring #:	NI	Sample #:	SG-11	Sample Date:	11/2/2012
Location:	Grid D2	Offset:	NI	Depth:	NI

**Maximum Dry Density** 84.2 PCF. **Optimum Moisture Content** 

ASTM D 698 -- Method A



Fine Fraction 🗵 Corrected for Oversize Fraction (ASTM D 4718) Moisture-Density Curve Displayed: #4 Sieve 区 3/8 inch Sieve □ 3/4 inch Sieve □ Sieve Size used to separate the Oversize Fraction: Moist Preparation □ Dry Preparation 🗵

Mechanical Rammer NI = Information not provided. ND = Not determined. References / Comments / Deviations:

Jennifer Olsen Jennetze LOBER Technician Name:

> **Project Engineer** Kyle Baucom Position Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Date: 11/12/12

Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision L	Date: 02/22/08		cm t b 22		A AGRICIO DE		•	7.	
			STM D 22 0751 S	<i>16</i>	AASHTO T 2		ale di escepta de la compania de la	ality Assurance	
Project #		5-11-032 Ph		outhern rine	Doulevalu ~	Report I		1/9/13	
Project N	lame: Mars	hall Industri	al Landfil	1 No.1 - Cells	3&4	Test Dat	e(s):	12/13-17/12	
Client Na		Energy							
Client Ac			1 Street, C	Charlotte, NC 2	28202				
Sample b	<i>-</i>	Alexander				Sample Dat		12/11/12	
	g Method:	NA				Drill l		NA	2 2 3304
Metho	d: A (1%)		B (0.19	%)	Balance ID.	3222	Calibration L	Date: <b>6/25/</b> /	
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
		ft. or m.		grams	grams	grams	grams	%	e
NA	SG-12	NA	L-42	85.85	389.10	323.63	65.47	27.5%	
					**********				3
									3 V 3 S
		***							
						<u> </u>			
***************************************			-						
		1640							1
									+
									-
•••									
N / B									
	viations / Referen					MANY 12			
Oven Ten	iperature set at				<u> </u>				
	<u> </u>					1			
ASTM D	2216: Laborator	ry Determinat	ion of Wat	r (Moisture) Co	ontent of Soil a	nd Rock by Ma	SS		
	Karen Warn Technician Nan		Ro	leu Ydl Signature	un	NICET 117 Certification Type		//9/1. Date	3
	Kyle Bauco Technical Responsi		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	ULL Signature		Project Engi	neer	1/9/13 Date	<u>}</u>
		This report sh	all not be rep	roduced, except in	full, without the wr	ritten approval of S	&ME, Inc.		

### Form No. TR-D4318-T89-90

Revision No. 0

### Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 X AASHTO T 89 AASHTO T 90 ASTM D 4318 Quality Assurance Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 1/9/13 1356-11-032 Phase 03 Report Date: Project #: 12/13-17/12 **Project Name:** Marshall Industrial Landfill No. 1- Cells 3&4 Test Date(s) Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 12/11/12 Sample #: SG-12 Boring #: NA Elevation: NA Offset: NA Cell 3&4 Subgrade Location: Black Grav Silt (ML) Fly Ash Sample Description: Type and Specification S&ME 1D # Cal Date: S&ME ID# Type and Specification Cal Date: 208367 10/29/2012 3222 6/25/2012 Grooving tool Balance (0.01 g) 20230 6/26/2012 Grooving tool LL Apparatus 9/5/2012 Grooving tool Oven 10844 Liquid Limit Plastic Limit Pan# Tare #: Tare Weight A В Wet Soil Weight + A Dry Soil Weight + A C D Water Weight (B-C) E Dry Soil Weight (C-A) F % Moisture (D/E)\*100 # OF DROPS N Moisture Contents determined by ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 N Factor N **Factor** 60.0 26 20 0.974 1.005 21 0.979 2.7 1.009 55.0 % Moisture Content 22 0.985 28 1.014 50.0 0.99 1.018 23 29 0.995 30 1.022 45.0 24 25 1.000 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 **Plastic Limit** 25.0 Plastic Index 20.0 Group Symbol ML 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method Estimate the % Retained on the #40 Sieve: Dry Preparation 7 Air Dried Wet Preparation Notes / Deviations / References: Oven Tmeperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technical Responsibility Technician Name This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

### Form No. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

# Particle Size Analysis of Soils

ASTM D 422



# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 1/9/13

1356-11-032 Phase 03

Project #:

 $K \times ((L/T)^{1/2})$ 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 00.001%0.001 100.0% %6.66 99.4% %9.76 Diameter 0.04964 0.03596 0.02361 0.01473 0.00779 0.00388 0.00165 91.1% 0.01073 \_ Q Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar 100.0% (washed) 100.0% 0.01571 0.01571 %6.66 99.4% Table 3 0.01571 0.01562 0.01571 %9.76 0.01571 Pan # 91.1% 0.01571 0.01571 Weathered & Friable  $\boxtimes$ Cal. Date: Retained Wt. 152H Effective Depth 0.30 1.18 4.44 10.0 10.5 13.2 14.0 15.9 0.00 11.3 14.7 15.4 0.07 0.0 0.0 0.0 0.0 0.0 0.01 Sieve Px % Passing #10 #100 3/4" 3/8" #10 09# #200 3.0" 1/2" #20 #40 1.5" 1.0" #4 P (total) =84.0% 77.5% 20.7% 3901 66.5% 41.5% 30.5% 12.0% 5.5% Soft 151H Percent Passing 526 South Church Street, Charlotte, NC 28202 237.78 389.10 Natural 323.63 27.5% 2.200 85.85 65.47 L-42 12/11/12 NA 1 min. (R x a / W) x 100 ID No. × Apparent Relative Density (Assumed) Hygroscopic P(-#10) =84.0% 77.5% 66.5% 41.5% 30.5% 20.7% 12.0% 5.5% 16.56 Type: 27.98 0.09% 27.97 11.41 0.01 12/13-18/12 Hard & Durable Dispersion Time: Sample Date: Hydrometer: Elevation: Hydrometer % Moisture (100 x D/E) (C-A) Water Wt. (B-C) 38.50 35.50 30.50 19.00 14.00 9.50 5.50 2.50 Moisture Content Wet Wt. + A Dry Wt. + A Test Date(s): Tare Wt. Tare# Dry Wt. × Composite Correction 6/25/2012 Address: Angular Corrections Д ⋖ B П C SG-12 Marshall Industrial Landfill No.1- Cells 3&4 NA ASTM D 422, D 2487, D 4318 Control Cylinder Cal. Date: Composite Correction 4.5 4.5 4.5 4.5 4.5 4.5 100.0% 200.84 200.84 4.5 200.66 50.00 49.96 1.09 Fly Ash Sample #: Offset: Rounded Hydrometer Reading 43.0 40.0 35.0 14.0 18.5 10.0 23.5 Beaker #: Sample Description: Black Gray Silt (ML) Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): Cell 3 & 4 Subgrade 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp. (0.5 °C) 21.5 21.5 22.0 21.5 21.5 21.5 21.5 21.5 Correction Factor a (Table 1):  $\times$ ID No. Fotal Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: ŇĀ Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: [ (Min.) Time 1440 250 15 30 09 3oring #: cocation: S Pan #:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900

Karen Warner

Technician Name

Certification #

1356-11-032 Phase 03 SG-12 Hydro.xls Page 1 of 1

0.

Project Engineer

Revision Date: 02/20/08

### **Particle Size Analysis of Soils**



ASTM D422

**Ouality Assurance** 

S&ME, Inc. ~ 9751 Southern Pine Bou	levard ~ Charlotte, NC 28273	
1356-11-032 Phase 03	Report Date:	1/9/13

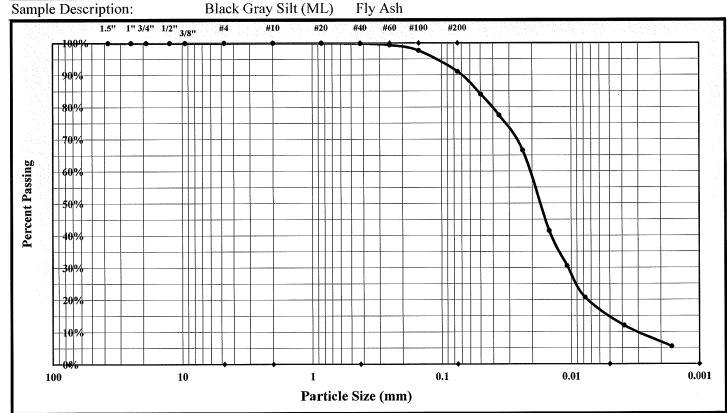
S&ME Project #: 12/13-18/12 Marshall Industrial Landfill No.1- Cells 3&4 Test Date(s): Project Name:

Client Name: **Duke Energy** 

Address: 526 South Church Street, Charlotte, NC 28202

Sample Date: 12/11/12 Boring #: NA Sample #: SG-12

Cell 3 & 4 Subgrade Offset: NA Elevation: NA Location:



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size: #20 Gravel: 0.0% Silt 76.6% Total Sand: 8.9% Clay 14.5% Silt & Clay (% Passing #200): 91.1% Moisture Content 27.5% Colloids ent Relative Density (Assumed) 2.200 NP Plastic Index NP NP Plastic Limit Liquid Limit Medium Sand: 0.1% Fine Sand: 8.7% Coarse Sand: 0.0% Weathered & Friable □ Description of Sand and Gravel Rounded Angular X Hard & Durable Soft Sodium Hexametaphosphate: 40 g./ Liter Mechanical Stirring Apparatus A Dispersion Period: 1 min. Dispersing Agent:

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Date:

Kyle Baucom Technical Responsibility Signature

**Project Engineer** Position

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project #:	1356-11-032 Pha			ulevard~Char	Report D		1/9/13
Project Name:	Marshall Industia		- Cells 3&4	maliwa	Test Dat		3/12-1/9/13
Client Name:	Duke Energy			- 113-11-11-11-11-11-11-11-11-11-11-11-11-			
Client Address:	526 South Church	Street, Charlo	otte, NC 2820	2			
Boring #:	NA		mple #:	SG-12	Sample D	Date: 12	2/11/2012
Location:	Cell 3&4	C	Offset:	NA	. De	pth:	NA
Sample Descripti	ion: Black Gi	ray Silt (ML)	Fly Ash				
Type and Specifica	ation S&ME I	D# Cal I	Date: Typ	e and Specificati	ion S&1	ME ID #	Cal Date:
Balance (0.1 g)	2218	2 6/8/2		npaction Mold	Again and a superior of the second	20231	1/6/2012
Balance	2218	and the second second second second		paction Hamme		20222	6/6/2012
Straightedge	2017	the same attached the responsible to the	2012 Ove	n		10844	5/9/2012
Sieve	2210		2012				
Water Content			P 2 Balance (0	0.1 gram Readab		Check:	=
ASTM D221		ITO T265 🗆		ASTM D4959		ASIMI	D4643 □ T
	Water Added:		шС	5K	AMRL	MJD	
A 75 337 : 14	Tare #;	1.000, 10.000,000,000,000	JLG 162.4		163.1	160.0	
A. Tare Weight	Α.	156.8	162.4	154.1			
B. Wet Wt + Tar		898.4	878.0	827.8	945.4	902.2	
C. Dry Wt. + Tai		771.5	739.3	687.4	766.6	726.6	
D. Water Weight		126.9	138.7	140.4	178.8	175.6	
E. Dry Weight	C-A	614.7	576.9	533.3	603.5	566.6	
F. Moisture Co	ntent 100*D/E	20.6%	24.0%	26.3%	29.6%	31.0%	
Compaction Da	ta Requires	a GP 5 Balance	for ASTM (1	gram or .0022 L	b. readability).	Check:	
ASTM D558 □	ASTM D 698		TM D1557 🗖	AASHTO			ITO T180 [
Method A ⊠		1			STM 1978) 🗆		O Method D [
G. Wt of Soil + I	Mold G.	5618	5680	5733	5724	5715	
H. Wt. of Mold	Н.	4239	4239	4239	4239	4239	
I. Wt. of Soil (g.	or lbs.) G-H	1379	1441	1494	1485	1476	
J. Wt of Soil (Lb	os.) 1/453.6 or 1	3.040	3.177	3.294	3.274	3.254	
K. Mold Volume	e Factor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (	PCF) J*K	91.5	95.6	99.1	98.5	97.9	
M. Dry Density	(PCF) L/(1+F)	75.9	77.1	78.5	76.0	74.7	
Sieve Size used to se	eparate the Oversize Fra	ction:	#4 Siev	e 🗵	3/8 inch Sieve	□ 3 <i>i</i>	/4 inch Sieve [
Mechanical Ram		Rammer		Moist Prep	aration	Dry Prep	aration [
References / Comm	***************************************						
Oven Temperature S	Set At 60C.						

Karen Warner

Technician Name

Kyle Baucom Technical Responsibility

NICET 117900 Certification Type/No.

Project Engineer

Position

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



Quality Assurance

S&ME Project #:	1356-11-032 P	hase		Report Date:	1/9/13
Project Name:	Marshall Indus	tial Landfill No.1 - Cell	ls 3&4	Test Date(s):	12/13/12-1/9/13
Client Name:	Duke Energy				
Client Address:	526 South Chu	rch Street, Charlotte, N	C 28202		
Boring #:	NA	Sample #:	SG-12	Sample Date:	12/11/2012
Location:	Cell 3&4	Offset:	NA	Depth:	NA

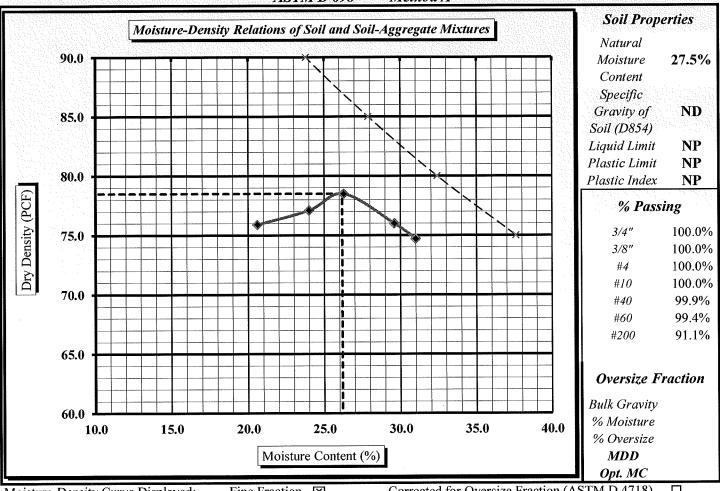
Sample Description: Black Gray Silt (ML)

**Maximum Dry Density** 

78.5 PCF. **Optimum Moisture Content** 

26.2%





Corrected for Oversize Fraction (ASTM D 4718) Fine Fraction 🗵 Moisture-Density Curve Displayed: #4 Sieve 区 3/4 inch Sieve □ 3/8 inch Sieve □ Sieve Size used to separate the Oversize Fraction: Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation 🗵

References / Comments / Deviations:

ASTM D 854: Specific Gravity of Soils

Technician Name:

Laren Warnen

## Particle Size Analysis of Soils



Revision Date: 02/20/08

*ASTM D 422* 

# S&ME, Inc. $\sim 9751$ Southern Pine Boulevard $\sim$ Charlotte, NC 28273

 $K \times ((L/T)^{1/2}$ 100.0%100.0% 100.0% 100.0% 100.0% %6.66 99.4% 0.001  $\frac{100.0\%}{100.0\%}$ 0.03616 0.01479 0.00386 0.00163100.0% 00.001 Diameter 0.04978 0.02436 0.01064 0.00770 97.7% 91.5% Percent Passing 40 g./ Liter 3/25/2012 Soil Mortar 99.4% 0.01544 (washed) 100.0% %6.66 97.7% 91.5% 100.0% Table 3 0.01544 0.01544 0.01544 0.01544 0.01544 0.01544 0.01544 Pan# Weathered & Friable × Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H Effective Depth 16.0 1.04 11.0 14.9 15.6 0.0 0.00 0.02 0.04 0.29 3.93 10.4 12.4 13.8 14.2 0.0 0.0 0.0 0.0 Sieve #200 P x % Passing #10 #100 1.0" 3/4" 1/2" 3/8" #20 #40 09# 1.5" #10 #4 P (total) = 76.7% 84.9% 55.4% 36.6% 29.5% 20.1% 9.4% 4.7% 3901 Soft 151H Percent Passing Address: 526 South Church Street, Charlotte, NC 28202 16.5% 253.64 302.23 Natural 260.37 41.86 2.200 6.73 12/27/12 NA 1 min. ID No. (Rxa/W)x100 × Apparent Relative Density (Assumed) P(-#10) =Hygroscopic 84.9% 76.7% 55.4% 36.6% 29.5% 20.1% 9.4% 4.7% 8.21% 15.78 27.25 26.38 10.60 0.87 50 Hard & Durable Dispersion Time: Sample Date: Hydrometer: Elevation: Test Date(s): 1/8-16/13 1/16/13 Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) (C-A) 36.00 32.50 23.50 15.50 12.50 8.50 4.00 2.00 Moisture Content Wet Wt. + A Dry Wt. + A Report Date: Tare Wt. Tare# Dry Wt.  $\boxtimes$ Composite Correction 6/25/2012 Angular Corrections Ö О Щ ⋖ М SG-13 Marshall Industrial Landfill No.1 - Cells 3&4 NA Fly Ash ASTM D 422, D 2487, D 4318 Cylinder Control Cal. Date: 4.5 4.5 4.5 100.0% 4.5 4.5 Composite Correction 4.5 4.5 4.5 332.94 332.94 307.69 50.00 46.21 1.09 Sample #: Offset: Rounded Hydrometer Reading 37.0 20.0 17.0 13.0 40.5 28.0 8.5 Beaker #: Sample Description: Black Gray Silt (ML) Fotal Sample Air Dried Wt. + tare wt. (grams): 1356-11-032 Phase 03 Weight of Air Dried Hydrometer Sample (g): 3222  $\boxtimes$ Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations (0.5 °C) Temp. 23.0 23.0 23.0 23.0 23.0 23.0 23.0 Oven Temperature Set at 60C. 23.0 Correction Factor a (Table 1): Grid C3 ID No. Fotal Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: NA Control Cylinder Hydrometer Jar #: roject Name: % Passing #10: Client Name: Balance: T (Min.) Time 1440 250 15 30 09 Project #: S Boring #: N ocation: Pan #:

Karen Warner Technician Name

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900

Certification #

1356-11-032 Phase 03 SG-13 Hydro.xls

Project Engineer

Page 1 of 1

Revision Date: 02/20/08

### Particle Size Analysis of Soils

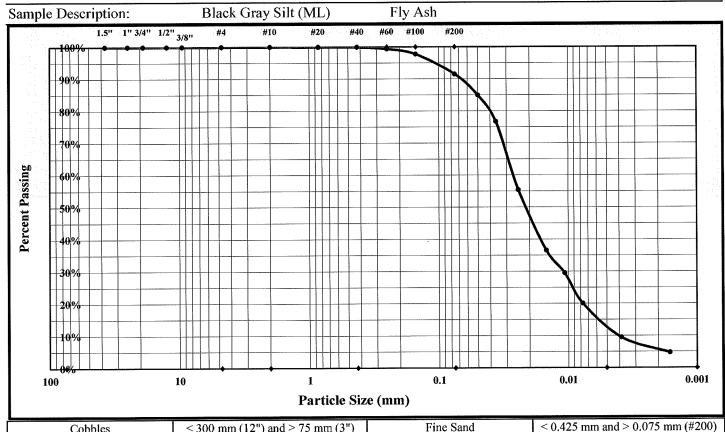


ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Ph	ase 03	Report Date:	1/16/13
Project Name:	Marshall Indust	rial Landfill No.1 - Cells 3&4	Test Date(s):	1/8-16/13
Client Name:	Duke Energy			
Address:	526 South Chur	ch Street, Charlotte, NC 28202		
Boring #:	NA	Sample #: SG-13	Sample Dat	e: 12/27/12
Location:	Grid C3	Offset: NA	Elevation	n: NA



Gravel	< 75  mm and > 4	.75 mm (#4)		Silt	<	< 0.075  and  > 0.075	005 mm
Coarse Sand	< 4.75 mm and >2	.00 mm (#10)		Clay		< 0.005 m	m
Medium Sand	< 2.00 mm and > 0	.425 mm (#40)	С	olloids		< 0.001 m	m
Maximum Particle Size	: #20		Gravel:	0.0%		Silt	78.5%
Silt & Clay (% Passing #200	): 91.5%	То	tal Sand:	8.5%		Clay	13.0%
ent Relative Density (Assumed	1) 2.200	Moisture	Content	16.5%		Colloids	
Liquid Lim	it NP	Plas	tic Limit	NP	P	lastic Index	NP
Coarse Sand	1: 0.0%	Medi	ım Sand:	0.1%		Fine Sand:	8.4%
Description of Sand and Gravel	Rounded 🗆	Angular 🗵	Hard & Du	rable 🗵	Soft [	] Weathered	& Friable □
Mechanical Stirring Apparatus A	Dispersion Pe	riod: I min.	Dispersing A	Agent: Sod	ium Hexamet	aphosphate:	40 g./ Liter

Fine Sand

References / Comments/ Repiations: ASTM D 4318, D 854, D 2487

Technician Name: Date:

< 300 mm (12") and > 75 mm (3")

Kyle Baucom Technical Responsibility Signature **Project Engineer** Position

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Cobbles

### Form No: TR-D2216-T265-1

Revision No. 0

### **Laboratory Determination of Water Content**



Revision L	Date: 02/22/08				A AGUITTO TO		•	***	
			STM D 22	ere element y new Alexandrian rational and a	AASHTO T 2	entropy of the body for his face and	CALIFORNIA DI ER RIPORISONIA	lity Assurance	
Project #	#: 1350	5&ME, Inc 5-11-032 Pk		outhern Pine	Douievaru ~	Report D		1/16/13	
Project N				l No.1 - Cells	3 & 4	Test Dat		1/8-16/13	
Client Na		e Energy							
Client Ac	dress: 526	South Churc	h Street, C	Charlotte, NC 2	8202				
Sample b	y: Kyle	Baucom				Sample Dat	e(s):	12/27/12	
Sampling	Method:	NA				Drill l	Rig:	NA	
Metho	d: A (1%	) 🔲	B (0.19	%) 🔽	Balance ID.	3222	Calibration D	ate: 6/25/	
Boring No.	Sample No.	Sample Depth	Tare#	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
		ft. or m.		grams	grams	grams	grams	%	e e
NA	SG-13	NA	1	6.73	302.23	260.37	41.86	16.5%	
									1.00AH 1.00AH
					***************************************				Tables
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					May				
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Notes / De	viations / Referen	ices			,		•		
Oven Ten	nperature Set at	60C.					4		
A STM D	2216: Laborato	ry Determinat	ion of Wate	er (Moisture) Co	ontent of Soil a	nd Rock by Ma	99		
ASIMD	2210. Laudiaiu	iy Determinat	ion or wate	(Moisture) ex	ontent of Son a	nd Rock by Ivia	33		
	Karen Warr		4 aa	UL U MUL Signature		NICET 117 Certification Type		[][Q] Date	3
	Kyle Bauco Technical Respons		14	A H Signature		Project Engi	ineer	<u>                                     </u>	
		This report sh	all not be rep	roduced, except in i	full, without the wr	itten approval of S	&ME, Inc.		



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 90 ASTM D 4318  $\boxtimes$ AASHTO T 89 · Quality Assurance Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 1/16/13 Report Date: Project #: 1356-11-032 Phase 03 1/8-16/13 Marshall Industrial Landfill No. 1- Cells 3&4 Test Date(s) Project Name: Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC 28202 Client Address: Sample Date: 12/27/12 Sample #: SG-13 Boring #: NA Offset: NA Elevation: NA Cell 3&4 Subgrade Location: Black Gray Silt (ML) Sample Description: Fly Ash Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: 20837 10/29/2012 Balance (0.01 g) 3222 6/25/2012 Grooving tool 20230 LL Apparatus 6/26/2012 Grooving tool 10844 9/5/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight Α В Wet Soil Weight + A  $\mathbf{C}$ Dry Soil Weight + A Water Weight (B-C) D Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F # OF DROPS N Moisture Contents determined by ASTM D 2216 LL LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 Factor N N Factor 60.0 20 0.974 26 1.005 21 0.979 27 1.009 55.0 % Moisture Content 0.985 28 1.014 22 50.0 0.99 29 1.018 23 45.0 24 0.995 30 1.022 1.000 25 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 100 10 15 20 25 30 35 40 # of Drops Multipoint Method  $\overline{\mathbf{A}}$ One-point Method Wet Preparation **Dry Preparation** Air Dried V Estimate the % Retained on the #40 Sieve: Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Kyle Baucom Karen Warner

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Technical Responsibility

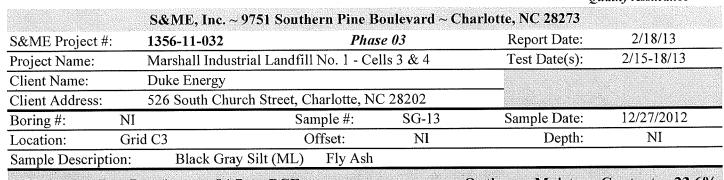
Technician Name

Revision Date: 11/21/07

### **Moisture - Density Report**



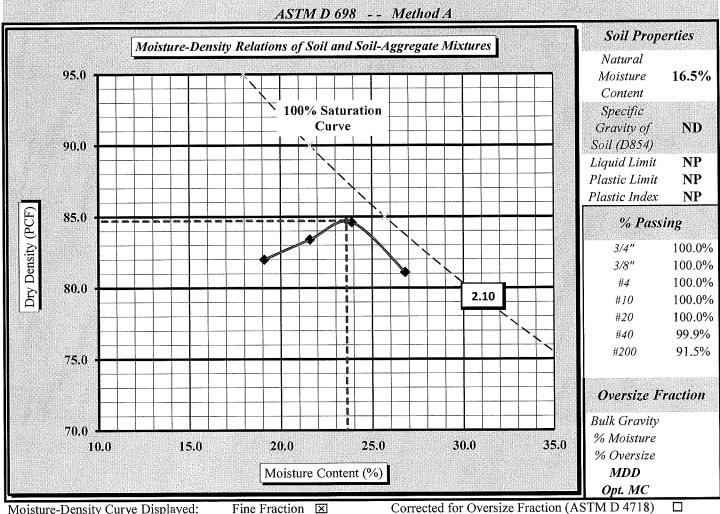
Quality Assurance



**Maximum Dry Density** 

84.7 PCF. **Optimum Moisture Content** 

23.6%



Corrected for Oversize Fraction (ASTM D 4718) Moisture-Density Curve Displayed: Fine Fraction 🗵 Sieve Size used to separate the Oversize Fraction: #4 Sieve 区 3/8 inch Sieve □ 3/4 inch Sieve □ Moist Preparation Dry Preparation Manual Rammer Mechanical Rammer ND = Not determined NI = Information was not provided References / Comments / Deviations: Technician: Jennifer Olsen Jenney J. Olsen Date: ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass Date: 2/18/13 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom Technical Responsibility Signature

Project Engineer Position

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558 D698 D1557 AASHTO T99 T180

Quality Assurance

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Se	&ME, Inc. ~	9751 South	. C. 15. 1 (0.00 C. 15. 16. 12. 16. 18. 18. 18. 16. 16. 16. 16. 16. 16. 16. 16. 16. 16	ulevard ~ Cha	C1117411-5-05/2004-4-10-4-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		
Project #: 1356-1			Phase		Report I		2/18/13
		Landfill No. 1 - Cells 3 & 4			Test Date(s)		2/15-18/13
Client Name: Duke F							
Client Address: 526 So	uth Church S	Street, Charlo	tte, NC 2820				
Boring #: NI			nple #:	SG-13	Sample I		12/27/2012
Location: Grid C			Offset:	NI	De	epth:	NI
Sample Description:		y Silt (ML)	Fly Ash				0.15
Type and Specification	S&ME ID			e and Specificati		<i>ME ID #</i>	
Balance (0.1 g)	22182	6/8/2		npaction Mold		20116 20222	2/4/2013 6/6/2012
Balance	22182	6/8/2		npaction Hamme		20222	11/20/2012
Straightedge Sieve #4	27711 10939	2/11/ 10/1/		Ш		22131	11/20/2012
				),1 gram Readab	ility)	Checl	·
Water Content ASTM D2216 ⊠		tent requires © FO T265 □	1 2 Dulance (1	ASTM D4959			C STM D4643 □
	iter Added:	350	400	300	250		
	Tare #:	JLG	18	691	DMJ		
A. Tare Weight	A.	162.2	156.6	157.3	164.0		
B. Wet Wt + Tare Wt	В.	1012.5	951.1	1184.1	1094.6		
C. Dry Wt. + Tare Wt.	C.	848.5	783.4	1001.5	945.6		
D. Water Weight	B-C	164.0	167.7	182.6	149.0		
E. Dry Weight	C-A	686.3	626.8	844.2	781.6		
F. Moisture Content	100*D/E	23.9%	26.8%	21.6%	19.1%		
Compaction Data	100000000000000000000000000000000000000	GP 5 Balance	for ASTM (1 TM D1557	gram or .0022 LI AASHTO	Т99 🗆		AASHTO T180
Method A ⊠	Method B				STM 1978) 🗆	A	ASHTO Method D
G. Wt of Soil + Mold	G.	5866	5836	5815	5759		
H. Wt. of Mold	H.	4283	4283	4283	4283		
I. Wt. of Soil (g. or lbs.)	G-H	1583	1553	1532	1476		
J. Wt of Soil (Lbs.)	I/453.6 or I	3.490	3.424	3.377	3.254		
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02		
L. Wet Density (PCF)	J*K	104.8	102.8	101.4	97.7		
M. Dry Density (PCF)	L/(1+F)	84.6	81.1	83.4	82.0		
Sieve Size used to separate the Mechanical Rammer	Manual I	Rammer	#4 Siev	Moist Prep			3/4 inch Sieve ry Preparation
References / Comments / Dev	iations:	*ND = Not dete	rmined *NI = I	nformation was no	t provided		
<u>Jennifer Olser</u> Technician Name		Junne	JOlsen jature	NICE Cert	J///7926 ification Type/No.		<u>2/18/2013</u> Date
<u>Kyle Baucom</u> Technical Responsibi		KLIK	Januare Tanana	Pro	pject Engineer Position	<u>r</u>	2/19/13 Date

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

					5.55 5.212 5.50			
 ONATE	. Inc. ~ 9751	Cauthann	Ding D	aulavand	- Chai	rlatta	NCO	2773
 X VIII	. inc. ~ 9/31	Southern.	Time D	uulevalu	~ Chai	i ivite, i	110 4	10415

Project #:	1356-11-032		Phase	03	Report D	ate: 3	3/4/13	
Project Name:	Marshall Industria	1 - Cells 3 &	4	Test Dat	e(s) $2/2$	25-27/13		
Client Name:	Duke Energy							
Client Address:	526 South Church	Street, Charlo	otte, NC 28202	2	1414.74			
Boring #:	NI	Saı	mple #:	SG-14	Sample D	ate: 1/3	31/2013	
Location:	Cell 3&4 Structura	al Fill — C	)ffset:	NI	De	pth:	NI	
Sample Description	n: Gray Bla	ck Silt (ML)	Fly Ash					
Type and Specificati	on S&ME II	O# Cal L		and Specificati		ME ID #	Cal Date:	
Balance (0.1 g)	22182	6/8/2		paction Mold		20116	2/4/2013	
Balance	22182			paction Hamme	r 2	20222	6/6/2012	
Straightedge	27711			n				
Sieve #4	10939							
Water Content		이 살아가 얼마나 아이들이 가셨다.	P 2 Balance (0	.1 gram Readab		Check:		
ASTM D2216		TO T265 □		ASTM D4959		ASTM D	4643 □	
	Water Added:	150	100	200	50	250		
	Tare #:	JMD	5C	SR	5L	5A		
A. Tare Weight	Α.	164.4	156.7	163.5	156.1	160.0		
B. Wet Wt + Tare	Wt B.	968.9	1067.5	1059.6	1089.8	2019.3		
C. Dry Wt. + Tare	Wt. C.	824.1	919.5	882.2	957.2	1612.4		
D. Water Weight	B-C	144.8	148.0	177.4	132.6	406.9		
E. Dry Weight	C-A	659.7	762.8	718.7	801.1	1452.4		
F. Moisture Cont	ent 100*D/E	21.9%	19.4%	24.7%	16.6%	28.0%		
Compaction Data	Requires a	a GP 5 Balance	for ASTM (1 g	gram or .0022 L	b. readability).	Check:		
ASTM D558 □	ASTM D 698	⊠ AS	TM D1557 🗖	AASHTO	T99 🗆	AASH	TO T180 🔲	
Method A ⊠	Method B	☐ Method	С	Method D (A	STM 1978) 🗖	AASHTO	Method D 🗆	
G. Wt of Soil + M	old G.	5916	5855	5888	5787	5896		
H. Wt. of Mold	H.	4282	4282	4282	4282	4282		
I. Wt. of Soil (g. o	r lbs.) G-H	1634	1573	1606	1505	1614		
J. Wt of Soil (Lbs.		3.602	3.468	3.541	3.318	3.558		
K. Mold Volume	/	30.02	30.02	30.02	30.02	30.02		
L. Wet Density (Po	CF) J*K	108.1	104.1	106.3	99.6	106.8		
M. Dry Density (1		88.7	87.2	85.2	85.4	83.4		
Sieve Size used to sep	arate the Oversize Frac	ction:	#4 Sieve		3/8 inch Sieve		4 inch Sieve □	
Mechanical Ramm		Rammer		Moist Prep		Dry Prepa	aration 🗵	
References / Commen	nts / Deviations:	*ND = Not deter	rmined *NI = In	formation was no	t provided			

Jennifer Olsen

Technician Name

Kyle Baucom Technical Responsibility

Certification Type/No.

**Project Engineer** 

Position

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



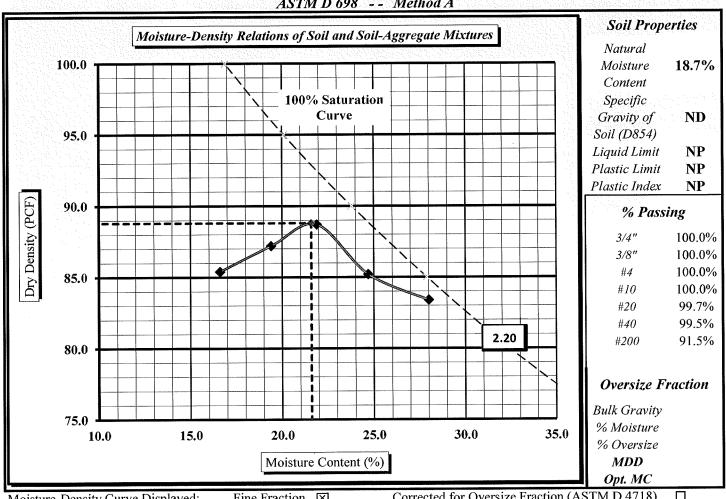
Quality Assurance

S&ME Project #:	1356-11-032	Pha	se 03	Report Date:	3/4/13
Project Name:	Marshall Industrial La	andfill No. 1 - Ce	ells 3 & 4	Test Date(s):	2/25-27/13
Client Name:	Duke Energy				
Client Address:	526 South Church Str	eet, Charlotte, N	C 28202		
Boring #:	NI	Sample #:	SG-14	Sample Date:	1/31/2013
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:	NI

**Maximum Dry Density** 

88.8 PCF. **Optimum Moisture Content** 21.6%

ASTM D 698 -- Method A



Corrected for Oversize Fraction (ASTM D 4718) Moisture-Density Curve Displayed: Fine Fraction 🗵 3/4 inch Sieve □ Sieve Size used to separate the Oversize Fraction: #4 Sieve ⊠ 3/8 inch Sieve □ Dry Preparation 🗵 Moist Preparation □ Mechanical Rammer  $\times$ Manual Rammer □ ND = Not determined NI = Information was not provided References / Comments / Deviations: & Olien Date: 3/4/13 Jenneber Technician: Jennifer Olsen ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom Technical Responsibility Signature

**Project Engineer** Position

### Form No. TR-D4318-T89-90



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 89 AASHTO T 90 **Ouality Assurance** ASTM D 4318  $\times$ Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 3/4/13 Report Date: 1356-11-032 Phase 03 Project #: 2/6-3/4/13 Marshall Industrial Landfill No. 1 - Cells # &4 Test Date(s) Project Name: Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 1/31/13 Sample #: SG-14 Boring #: NA Cell 3 & 4 Structural Fill Elevation: NA Offset: NA Location: Gray Black Silt (ML) Fly Ash Sample Description: Cal Date: Type and Specification S&ME ID# S&ME ID# Type and Specification Cal Date: 27704 2/14/2013 6/24/2012 Grooving tool Balance (0.01 g) 3222 6/26/2012 20230 Grooving tool LL Apparatus 10844 2/4/2013 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight Α Wet Soil Weight + A В  $\mathbf{C}$ Dry Soil Weight + A Water Weight (B-C) D Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F # OF DROPS N Moisture Contents determined by ASTM D 2216 LL LL = F \* FACTORAve. Average One Point Liquid Limit 65.0 N Factor N Factor 0.974 26 1.005 60.0 20 21 0.979 27 1.009 55.0 % Moisture Content 22 0.985 28 1.014 50.0 0.99 29 1.018 23 0.995 30 1.022 24 45.0 1.000 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method Estimate the % Retained on the #40 Sieve: **Dry Preparation** 1 Wet Preparation Air Dried Notes / Deviations / References: Oven Temperature Set at 60 C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name



Kyle Baucom Technical Responsibility

### Form No. TR-D422-2

## Particle Size Analysis of Soils

**SWME** 

Revision No. 0

Revision Date: 02/20/08

ASTM D 422

# S&ME, Inc. $\sim 9751$ Southern Pine Boulevard $\sim$ Charlotte, NC 28273

Report Date: 3/4/13

1356-11-032 Phase 03

Project #:

 $\overline{K} \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 100.0%Diameter 0.01487 0.01089 0.00774 0.00389 0.00165 100.0% %2.66 97.0% 0.04944 0.03596 0.02404 100.0% 100.0% 00.001 99.5% %0.66 91.5% Percent Passing 40 g./ Liter 3/25/2012 Soil Mortar 100.0% Table 3 %8.66 99.5% 99.1% %0.76 0.01571 0.01571 (washed) 0.01571 0.01562 0.01562 91.5% 0.01571 0.01571 0.01571 Pan# Weathered & Friable Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H Effective Project Engineer Depth 10.5 16.0 13.4 14.4 15.5 1.49 0.09 0.12 0.25 0.47 6.6 11.7 14.7 0.0 0.0 0.0 0.0 0.0 Sieve Px%Passing#10 #100 #200 1.0.1 3/4" 3/8" #10 #20 #40 09# 3.0" 1/2" #4 P (total) = 77.5% 38.2% 85.1% 61.1% 25.1% 20.7% 10.9% 4.4% 3901 Soft 151H Percent Passing 335.56 213.67 295.55 526 South Church Street, Charlote, NC 28202 18.7% 81.88 Natural 2.200 40.01 1/31/13 NA 1 min. ID No. (R x a / W) x 100 × Apparent Relative Density (Assumed) P(-#10) =Hygroscopic 85.1% 77.5% 61.1% 38.2% 25.1% 20.7% 10.9% 4.4% 0.20% 15.88 26.05 26.07 10.17 0.02 Hard & Durable Dispersion Time: 2/26-3/4/13 Sample Date: Hydrometer: Elevation: Hydrometer % Moisture  $(100 \times D/E)$ Water Wt. (B-C) Dry Wt. (C-A) 35.50 39.00 28.00 17.50 9.50 5.00 2.00 Moisture Content Wet Wt. + A Dry Wt. + A Test Date(s): Tare Wt. Tare #  $\boxtimes$ Composite Correction 6/25/2012 Address: Angular Corrections Ω ш ď B Ö Marshall Industrial Landfill No.1 - Cells 3 & 4 SG-14 NA ASTM D 422, D 2487, D 4318 NICET 117900 Control Cylinder Fly Ash Cal. Date: Composite Correction 5.0 5.0 5.0 5.0 5.0 5.0 5.0 301.60 %0.001 301.60 50.03 301.01 49.93 1.09 Sample #: Offset: Rounded Hydrometer Reading 22.5 16.5 10.0 44.0 40.5 33.0 14.5 Sample Description: Gray Black Silt (ML) Beaker #: Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): Cell 3 & 4 Structural Fill 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp. (0.5°C) 22.0 21.5 Oven Temperature Set at 60C. 21.5 21.5 21.5 21.5 22.0 × Correction Factor a (Table 1): ID No. Total Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 30 09 15 S a 3oring #: ocation: Pan #:

S&ME, Inc. - Corporate

Karen Warner

Technician Name

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Certification#

Kyle Baucom

1356-11-032 Phase 03 SG-14 Hydro.xls Page 1 of 1

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03			Report Date:		3/4/13
Project Name:	Marshall Industrial La	ndfill No.1 - Cells 3	3 & 4	Test Date(s):	2	/26-3/4/13
Client Name:	Duke Energy					
Address:	526 South Church Stre	eet, Charlote, NC 28	3202		14%	
Boring #:	NA	Sample #: SG-1	4	Sample	Date:	1/31/13
Location:	Cell 3 & 4 Structural	Offset: NA		Eleva	ation:	NA

Sample Description: Gray Black Silt (ML) Fly Ash 1" 3/4" 1/2" 3/8" #200 #60 #100 #10 #20 #40 Percent Passing 0.001 0.01 0.1 10 Particle Size (mm)

Cobbles	obbles < 300 mm (12		d > 75 mm (3")	Ì	Fine Sand	< 0.425 mm and > 0.075 mm (#200)		
Gravel	< 75	< 75 mm and > 4.75 mm (#4)		Silt		< 0.075  and  > 0.0	005 mm	
Coarse Sand	< 4.75	5 mm and >2	2.00 mm (#10)		Clay	< 0.005 mm		
Medium Sand	< 2.00	mm and > (	).425 mm (#40)		Colloids	< 0.001 mr	n	
Maximum Particle S	ize:	#10		Gravel:	0.0%	Silt	77.0%	
Silt & Clay (% Passing #2	200):	91.5%	То	tal Sand:	8.5%	Clay	14.5%	
ent Relative Density (Assur	ned)	2.200	Moisture	e Content	18.7%	Colloids		

Liquid Limit	NP	Plastic Limit	NP	Р	lastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	0.5%		Fine Sand:	8.0%
Description of Sand and Gravel	Pounded []	Angular 🔯 1-lard & Dura	ble 🔯	Soft F	1 Weathered &	Friable []

Description of Sand and Gravel Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐ Mechanical Stirring Apparatus A ? Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References / Comments / Devigitions: ASTM D 4318, D 854, D 2487 Oven Temperature Set at 60C.

Technician Name: \( \frac{1}{2} \text{UM ( \text{ \text{AUU}} \) \( \text{Date: } \frac{3/4//3}{2} \)

Kyle Baucom
Technical Responsibility

Signature

Project Engineer

Position

5/6/13 Date

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-032	Phase 03			Report I	Date:	3/22/13
Project Name:	Marshall Industria	l Landfill No.	& 4	Test Da	te(s)	3/6-8/13	
Client Name:	Duke Energy			W			
Client Address:	526 South Church	Street, Charlo	otte, NC 28	202			
Boring #:	NI	Sa	mple #:	SG-15	Sample I	Date:	2/27/2013
	Cell 3&4 Structura	al Fill C	Offset:	NI	De	epth:	NI
Sample Description	n: Black Gr	ay Silt (ML)	Fly .	Ash			1000
Type and Specification	on S&ME II	D# <i>Cal I</i>	Date: T	ype and Specificat	ion S&	ME ID #	Cal Date:
Balance (0.1 g)	22182	6/8/2	2012 C	ompaction Mold		20116	2/4/2013
Balance	22182	2 6/8/2	2012 C	ompaction Hamm	er :	20222	6/6/2012
Straightedge	2771			ven		22151	11/20/2012
Sieve #4	10939		/2012				
Water Content			GP 2 Balance	(0.1 gram Readah		Check:	
ASTM D2216		TO T265 □	· .	ASTM D4959		AST	M D4643 □
	Water Added:	200	250	300	350		
	Tare #:	5L	MJD	KH	G		
A. Tare Weight	A.	156.4	160.0	158.8	158.7		
B. Wet Wt + Tare	Wt B.	1032.2	1152.1	1093.5	1050.3		
C. Dry Wt. + Tare	Wt. C.	910.0	991.5	931.3	878.3		
D. Water Weight	B-C	122.2	160.6	162.2	172.0		
E. Dry Weight	C-A	753.6	831.5	772.5	719.6		
F. Moisture Cont	ent 100*D/E	16.2%	19.3%	21.0%	23.9%		
<b>Compaction Data</b>	Requires	a GP 5 Balance	for ASTM (	(1 gram or .0022 L	b. readability).	Check:	
ASTM D558 □	ASTM D 698	⊠ AS	TM DI557	□ AASHTC	T99 🗆	AA	ASHTO T180 □
Method A ⊠	Method B	☐ Method	IC 🗆	Method D (A	STM 1978) 🗆	AAS	HTO Method D
G. Wt of Soil + Mo	old G.	5858	5929	5953	5930		
H. Wt. of Mold	Н.	4282	4282	4282	4282		
I. Wt. of Soil (g. or	r lbs.) G-H	1576	1647	1671	1648		
J. Wt of Soil (Lbs.	) I/453.6 or I	3.474	3.631	3.684	3.633		
K. Mold Volume F	actor K.	30.02	30.02	30.02	30.02		
L. Wet Density (PC	CF) J*K	104.3	109.0	110.6	109.1		
M. Dry Density (P	PCF) L/(1+F)	89.8	91.4	91.4	88.1		
Sieve Size used to sepa	arate the Oversize Frac	tion:	#4 Si	eve 🗵	3/8 inch Sieve		3/4 inch Sieve □
Mechanical Ramme	er 🗵 Manual	Rammer		Moist Prep	aration	Dry F	Preparation 🗵
References / Commen	ts / Deviations:	*ND = Not dete	rmined *NI =	Information was no	t provided		
<del>уш</del>							
<u> </u>							
<u>Jennife</u>	r Olsen	Jennati (	JOlsen 3	122/13 MCT	/117926 (KB,	)	3/8/2013

Technician Name

Kyle Baucom Technical Responsibility

Signature

Certification Type/No.

Date

Date

### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### **Moisture - Density Report**



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

3/22/13 Phase 03 Report Date: S&ME Project #: 1356-11-032 3/6-8/13 Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s): Project Name: Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC 28202 Client Address:

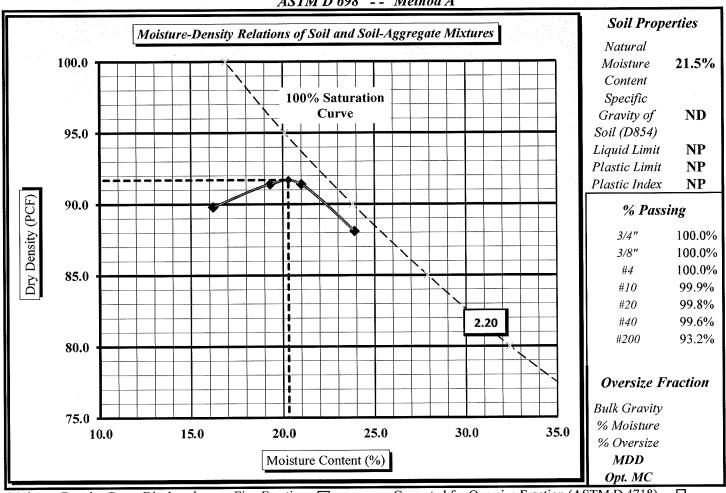
Sample Date: 2/27/2013 NI Sample #: SG-15 Boring #:

NI Depth: NI Cell 3&4 Structural Fill Offset: Location:

Sample Description: Black Gray Silt (ML) Fly Ash

**Maximum Dry Density** 91.7 PCF. **Optimum Moisture Content** 20.3%

ASTM D 698 -- Method A



Corrected for Oversize Fraction (ASTM D 4718) Moisture-Density Curve Displayed: Fine Fraction 🗵 3/4 inch Sieve □ Sieve Size used to separate the Oversize Fraction: #4 Sieve ⊠ 3/8 inch Sieve □ Dry Preparation ⊠ Mechanical Rammer × Manual Rammer Moist Preparation □ ND = Not determined NI = Information was not provided References / Comments / Deviations:

Date: 3/8/13 Technician: Jennifer Olsen Jungar Julie 3/20/13

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698; Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom Signature Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

### Form No. TR-D422-2

Revision No. 0

# Particle Size Analysis of Soils

**♦S&ME** 

Revision Date: 02/20/08

**ASTM D 422** 

# S&ME, Inc. $\sim 9751$ Southern Pine Boulevard $\sim$ Charlotte, NC 28273 Report Date: 3/21/13

		Percent Passing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	%6.66	%8.66	%9.66	99.2%	%8′.26	93.2%		લ	2		Diameter	= Q	$K \times ((L/T)^{1/2}$	0.04934	0.03560	0.02364	0.01446	0.01061	0.00772	0.00389	0.00164			21/5/18
		Percent	Dow #	rall#	(waslicu)			Soil Morton	SUII IVIOI LAI	700.001	%6.66	%8.66	%4.66	%6.76	93.4%	Friable [	te: 40 g./ Liter	3/25/2012	×	Table 3	Caroni	K	0.01562	0.01562	0.01562	0.01562	0.01562	0.01562	0.01562	0.01562			
		Retained Wt.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.63	0.04	0.11	0.32	1.04	3.32	Weathered & Friable	Sodium Hexametaphosphate:	Cal. Date:	152H	Effective	Depth	L	10.0	10.4	11.5	12.9	13.8	14.7	15.5	16.0			Project Engineer
·  -  -		Sieve	3.0"	1.5"	1.0"	3/4"	1/2"	3/8"	#4	#10	#20	#40	09#	#100	#200		odium Hex	3901			P (total) =	P x % Passing #10	83.8%	78.4%	64.2%	45.7%	32.7%	21.8%	10.9%	4.4%			Projec
		IC 28292	2/27/13	NA		2.200		Natural	333	82.90	487.98	416.26	71.72	333.36	21.5%	Soft			151H	Percent Passing			83	78	94	45	32	21	01	4.			
13	2/30-3/5/13	526 South Church Street, Charlotte, NC 28292	Date: 2/7	Elevation:		y (Assumed)		Hygroscopic	WN	16.55	27.81	27.80	0.01	11.25	%60.0	Ourable 🗵	n Time: 1 min.	neter: ID No.	Type:	Percei	P(-#10) =	$(R \times a / W) \times 100$	83.9%	78.5%	64.3%	45.8%	32.7%	21.8%	10.9%	4.4%			ucom
Report Date: 3/21/13	Test Date(s): 2/30-	South Church Si	Sample Date:	Eleva		Apparent Relative Density (Assumed)		Moisture Content	Tare #	Tare Wt.	Wet Wt. + A	Dry Wt. + A	r Wt. (B-C)	Wt. (C-A)	% Moisture (100 x D/E)	X Hard & Durable	Dispersion Time:	Hydrometer:		Hydrometer	11yarometr	R	38.50	36.00	29.50	21.00	15.00	10.00	5.00	2.00			Kyle Baucom
Repor		Address: 526				Apparent		Moistur		A T	B We	D	D Water Wt.	E Dry Wt.	% Moisture	Angular		6/25/2013		ions	Composite	Correction											
	. 1- Cells 3 & 4	Add	ole #: SG-15	Offset: NA	Fly Ash				461.61	461.61	50.04	461.20	50.00	%6.66	1.09	Ang		Cal. Date: 6,	orrection	Corrections	Control	Cylinder	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	D 2487, D 4318		NICET 117900
e 03	Landfill No		Sample #:		lt (ML)	Beaker #:			rams):		(g):					Rounded	В		Composite Correction	Uxidrometer	nyarometer	Reading	43.5	41.0	34.5	26.0	20.0	15.0	10.0	7.0	ASTM D 422, I		
1356-11-032 Phase 03	Marshall Industrial Landfill No. 1- Cells 3 & 4	Duke Energy	NA	Cell 3 & 4 Structural Fill	on: Gray Black Silt (ML)	B		rams):	Fotal Sample Air Dried Wt. + tare wt. (grams):	mple Air Dried:	Weight of Air Dried Hydrometer Sample (g):	Dried:	e Oven Dried (W):		a (Table 1):	Description of Sand & Gravel Particles	ratus: A 🗵	ID No. 3222	×	Toma	·	(0.5 °C)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	Ì	e Set at 60C.	Karen Warner
Project #:	Project Name:	Client Name:	Boring #:	Location:	Sample Description:	Pan #:	Hydrometer Jar #:	Pan Tare Weight (grams):	Total Sample Air D	Weight of Total Sample Air Dried:	Weight of Air Drie	Total Sample Oven Dried:	Hydrometer Sample Oven Dried	% Passing #10:	Correction Factor a (Table 1):	Description of Sanc	Stirring Apparatus:	Balance:	Control Cylinder	Timo	TITLE	T (Min.)		2	5	15	30	09	250	1440	References / Comments / Deviations	Oven Temperature Set at 60C.	N E

Technician Name S&ME, Inc. - Corporate

Technical Responsibility 3201 Spring Forest Road Raleigh, N.C. 27616

Certification #

1356-11-032 Phase 02 SG-15 Hydro.xls Page 1 of 1

Position

Date

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

S&ME Project #:	1356-11-032 Phase 03			Report Date:	3/21/13	
Project Name:	Marshall Industrial La	ndfill No. 1- C	Test Date(s):	2/30-3/5/13		
Client Name:	Duke Energy					
Address:	526 South Church Stre	et, Charlotte,	NC 28292			
Boring #:	NA	Sample #:	SG-15	Sample Dat	e: 2/27/13	
Location:	Cell 3 & 4 Structural	Offset:	NA	Elevatio	n: NA	

Gray Black Silt (ML) Sample Description: Fly Ash 1" 3/4" 1/2" 3/8" #100 1.5" #10 #20 #40 #60 #200 Percent Passing 0.001 0.1 0.01 10 Particle Size (mm)

Cobbles	< 300 mm (12") and > 75	5 mm (3") Fi	ne Sand	< 0.425 mm and > 0.07	75 mm (#200)
Gravel	< 75 mm and > 4.75 m	nm (#4)	Silt	< 0.075  and  > 0.0	005 mm
Coarse Sand	< 4.75 mm and >2.00 m	nm (#10)	Clay	< 0.005 mr	n
Medium Sand	< 2.00 mm and > 0.425 r	mm (#40) C	olloids	< 0.001 mr	n
Maximum Particle	e Size: #10	Gravel:	0.0%	Silt	78.7%
Silt & Clay (% Passing	#200): 93.2%	Total Sand:	6.8%	Clay	14.5%

Maximum Particle Size:	#10		Gravel:	0.0%			Silt	78.7%
Silt & Clay (% Passing #200):	93.2%	Tot	tal Sand:	6.8%			Clay	14.5%
ent Relative Density (Assumed)	2.200	Moisture	Content	21.5%			Colloids	
Liquid Limit	NP	Plas	tic Limit	NP		Plas	tic Index	NP
Coarse Sand:	0.1%	Mediu	ım Sand:	0.2%		Fi	ne Sand:	6.4%
Description of Sand and Gravel	Rounded 🗆	Angular 🗵	Hard & Du	rable 🗵	Soft		Weathered	& Friable 🛚
Mechanical Stirring Apparatus A	Dispersion Per	riod: 1 min.	Dispersing A	Agent: Soc	ium Hexa	ametapl	nosphate:	40 g./ Liter
	- 100011D	1010 D 051 D 01	105					

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Jalu Ullu Date: 3/13/13-

Kyle Baucom
Technical Responsibility

Signature

Project Engineer

Position

3/25/13 Date



Revision	No. 0	Lia	i I bin	mit, Pla	stic T	imit a	nd P	lactic I	ndev		XI	AIE
Revision	Date: 11/20/07	Liq	ulu 171	11111, 1 141	suc L	111111, 0	11101 1	iastic i	HUCA	•		
Another	code	ASTM D 4318	X	AASHT	O T 89		AAS	SHTO T 90		Qua	lity Assura	ance
		S&ME, In	c. ~975	1 Souther	n Pine	Boule	vard,C	Charlotte	e, NC 282	73		
Project	#: 1356	-11-032 Pha							Report I		3/22/1	13
Project		shall Industria		fill No. 1-	Cells 3	& 4			Test Da		2/30-3/2	2/13
Client N		e Energy		- I I I I I I I I I I I I I I I I I I I	<del></del>			* -/*				
		South Church	Street	, Charlotte	, NC 2	8202						
Boring	#: NA		Sar	nple #: SC	3-15			Sam	ple Date:	2/27/13		
Locatio	n: Cell 3&4 S	Structural Fill		Offset: NA	4			E	Elevation:	NA		
Sample	Description:	Black G	ray Silt	(ML) Fly	/ Ash							
Type and	d Specification	S&ME I	D #	Cal Dat			_	ification		ME ID #	Cal I	
	(0.01 g)	3222		6/25/20		Groovin				27704	2/4/	2013
LL Appa	aratus	3653		2/26/20		Groovin						<del>.</del>
Oven Pan	H	1084	4	2/4/201		Groovir Liquid Lir					Plastic Limi	in <b>A</b> Santsyrks (s)
Pan	#	Tare #:					1111		NEW TOTAL		Thasire Emili	
A	Tare V						·				-	
В	Wet Soil W											
$\frac{D}{C}$	Dry Soil W											
$\frac{\overline{D}}{D}$	Water Wei											
E	Dry Soil We		<u> </u>									
F	% Moisture											
N	# OF D						·····			Moisture	Contents de	<u>l</u> etermine
LL	$LL = \mathbf{F} * \mathbf{I}$						·····				ASTM D 22	
Ave.	Aver								<u></u>			
		480							Τ	One Point I	Liquid Limit	
	65.0								N	Factor	N	Factor
	60.0								20	0.974	26	1.005
핕	55.0								21	0.979	27	1.009
ntent	50.0								22 23	0.985	28	1.014
% Moisture Cor	45.0								24	0.99	30	1.018
ar e									25	1.000	- 50	1.022
ist	40.0								<u> </u>	P, Non-Pla	astic	X
Ĭ	35.0								111	Liquid L		
8	30.0									Plastic L		
	25.0								٠.			
	•									Plastic I		
	20.0	15 20	25 3	<del>1   1  </del> 30 35 40		// ers	·	100		Group Syr	···	<u>/L</u>
		15 20	25 .	50 55 40	Ļ	# of Dro	ps			Multipoint N		$\subseteq$
<u> </u>			.•		1		F			One-point N		
	reparation	Dry Prepara	tion L	Air I	ried		Esti	mate the %	Retained of	1 ine #40 Si	eve:	
	Peviations / Reference Emperture Set at 6											
Oven 10	importure set at c	, , , , , , , , , , , , , , , , , , ,								***************************************		***************************************
ASTM L	) 4318: Liquid Lii	mit, Plastic Lir	nit, & P	lastic Index	c of Soil	ls						
				2/12	10						2/2	-/12
	Karen Warr Technician Nar			Date	15	_		yle Bauc nical Respon			) <u>/</u>	<u>)                                    </u>
	i ecnnician Nar	ne		Duie			1 contr	war nespon	wivilly		$\nu$	

## Particle Size Analysis of Soils

**SWME** 

Revision No. 0

Revision Date: 02/20/08

ASTM D 422

# S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273 4/2/13

Report Date:

1356-11-032 Phase 03

Project #:

 $K \times (L/T)^{1/2}$ 100.0% 100.0%0.02350 100.0%100.0% %0.001 %9.66 93.9% Diameter 0.03589 0.01440 0.01064 0.00775 0.00390 0.00167 100.0% 100.0% 100.0% 0.04953 %6.66 %8.66 %9.86 Percent Passing Sodium Hexametaphosphate: 40 g./ Liter Soil Mortar Table 3 0.01581 (washed) 100.0% 93.9% 0.01581 0.01581 %8.66 %9.66 98.7% 0.01581 0.01581 0.01581 0.01581 %6.66 0.01571 Pan# Weathered & Friable  $\boxtimes$ Cal. Date: Retained Wt. 152H Effective Depth 10.3 11.0 12.4 13.6 0.09 3.04 14.4 16.0 0.02 0.03 0.6715.4 0.0 0.0 0.0 0.0 0.0 0.0 0.21 9. 8. 0.0 Sieve Px % Passing #10 #100 #200 3/8" 09# 1.0" 3/4" #10 #40 3.0" 1.5" 1/2" #20 #4 P (total) =%0.07 51.4% 86.4%79.8% 36.1% 25.2% 12.0% 3.3% 3901 Soft 151H Percent Passing 526 South Church Street, Charlotte, NC 28202 285.96 319.44 18.5% 104.75 Natural 181.21 33.48 2.200 Fish 3/15/13 X 1 min. (Rxa/W)x100 ID No. × Apparent Relative Density (Assumed) P(#10) =Hygroscopic 86.4% 70.0% 51.4% 25.2% 12.0% 79.9% 36.1% 3.3% 0.38% Type: 15.80 10.57 26.41 26.37 0.04 59 3/19-4/2/13 Hard & Durable Dispersion Time: Hydrometer: Sample Date: Elevation: Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) Dry Wt. (C-A) 36.50 32.00 16.50 11.50 39.50 23.50 5.50 1.50 Moisture Content Wet Wt. + A Dry Wt. + A 2 Test Date(s): Tare Wt. Tare# × Composite Correction 6/25/2012 Address: Angular Corrections Д щ K В Ö Marshall Industrial Landfill No.1 - Cells 3 & 4 SG-16 NA ASTM D 422, D 2487, D 4318 Cylinder Control Cal. Date: Composite Correction 5.5 5.5 5.5 5.5 5.5 100.0% 5.5 5.5 253.48 254.44 254.44 49.82 50.01 1.09 Fly Ash Sample #: Offset: Rounded Hydrometer Reading 42.0 22.0 17.0 11.0 45.0 37.5 29.0 Sample Description: Black Gray Silt (ML) Beaker #: Total Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): Cell 3&4 Structural Fill 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp. (0.5 °C) 21.0 21.0 21.0 21.0 21.0 21.0 21.5 21.0 OvenTemperature Set at 60C. Correction Factor a (Table 1): × ID No. Fotal Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: NA Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Balance: Client Name: (Min.) Time 1440 250 30 09 15 S Boring #: ocation: Pan #:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900 Certification #

Karen Warner

Technician Name

1356-11-032 Phase 03 SG-16 Hydro.xls Page 1 of 1

Project Engineer

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

S&ME, Inc. ~ 9751 Southern P	ie Boulevard ~ Charlotte	, NC 28273
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S&ME Project #:	1356-11-032 Phase 03	3	Report Date:	4/2/13
Project Name:	Marshall Industrial La	andfill No.1 - Cells 3 & 4	Test Date(s):	3/19-4/2/13
Client Name:	Duke Energy			
Address:	526 South Church Str	eet, Charlotte, NC 28202		
Boring #:	NA	Sample #: SG-16	Sample Dat	te: 3/15/13
Location:	Cell 3&4 Structural	Offset: NA	Elevatio	on: NA

< 300  mm  (12")  and  > 75  mm  (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm
	< 75 mm and > 4.75 mm (#4) < 4.75 mm and >2.00 mm (#10)	< 75 mm and > 4.75 mm (#4) Silt < 4.75 mm and >2.00 mm (#10) Clay

Maximum Particle Size:	#10	Gravel: 0.0%		0.0%		Silt	82.9%
Silt & Clay (% Passing #200):	93.9%	Total Sand: 6.1		6.1%	Clay		11.0%
ent Relative Density (Assumed)	2.200	Moisture Content 18.5		18.5%			
Liquid Limit	NP	Plas	tic Limit	NP		Plastic Index	NP
Coarse Sand:	0.0%	Mediu	ım Sand:	0.2%		Fine Sand:	5.9%
Description of Sand and Gravel	Rounded	Angular ⊠	Hard & Dura	ble 🗵	Soft	☐ Weathered &	& Friable 🛚
Mechanical Stirring Apparatus A	Dispersion Per	iod: 1 min.	Dispersing Ag	gent: So	odium Hexa	ametaphosphate:	40 g./ Liter
n C	A CTM D	210 D 954 D 2/	197	-			

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Kyle Baucom

Signature

Project Engineer

Position

4//2//3 Date

This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Date:

Technical Responsibility

**Technician Name:** 



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 90 ASTM D 4318  $\times$ AASHTO T 89 Another code Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 4/1/13 Project #: 1356-11-032 Phase 03 Report Date: 3/19-4/1/13 Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s) **Project Name:** Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC 28202 Client Address: Sample #: SG-16 Sample Date: 3/15/13 Boring #: NA Cell 3&4 Structural Fill Offset: NA Elevation: NA Location: Sample Description: Black Gray Silt (ML) Fly Ash Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 3222 6/25/2012 Grooving tool 27704 2/4/2013 LL Apparatus 3653 2/26/2013 Grooving tool 10844 2/4/2013 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight Α В Wet Soil Weight + A  $\mathbf{C}$ Dry Soil Weight + A Water Weight (B-C) D Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F # OF DROPS N Moisture Contents determined bv ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 **Factor** N **Factor** N 60.0 20 0.974 26 1.005 21 0.979 27 1.009 55.0 % Moisture Content 0.985 1.014 22 28 50.0 23 0.99 29 1.018 45.0 24 0.995 30 1.022 1,000 25 40.0 NP, Non-Plastic X 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index 20.0 Group Symbol ML 10 100 15 20 30 35 40 25 # of Drops Multipoint Method One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation **Dry Preparation** 7 Air Dried **✓** Notes / Deviations / References: Oven Temperature Set at 60C. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Kyle Baucom Karen Warner Technician Name Technical Responsibility

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project #: 1356	-11-032		Phase	03	Report I	Date:	4/2/13
	shall Industrial	Landfill No	. 1 - Cells 3 &	. 4	Test Da	te(s)	3/21-25/13
Client Name: Duke	e Energy						
Client Address: 526	South Church S	treet, Charl	otte, NC 2820	2			
Boring #: NI		Sa	ımple #:	SG-16	Sample I	Date:	3/15/2013
Location: Cell	3&4 Structural	Fill (	Offset:	NI	De	epth:	NI
Sample Description:	Black Gra	y Silt (ML)	Fly Ash	l			
Type and Specification	S&ME ID	# Cal	Date: Typ	e and Specificati	on S&	ME ID #	Cal Date:
Balance (0.1 g)	22182		to the extremely followed to their and	npaction Mold	A CONTRACTOR OF THE PARTY	20116	2/4/2013
Balance	22182			npaction Hamme		20222	6/6/2012
Straightedge	27711		/2013 Ove	n		22151	11/20/2012
Sieve #4	10939		2013				American service annual medium (service)
Water Content ASTM D2216 ⊠		ent requires © O T265 □	GP 2 Balance ((	).1 gram Readab ASTM D4959		Check: ASTN	M D4643 □
	Water Added:	200	150	100	50	As Is	
	Tare #:	SQ-1	BE	6910	5K	PFM	
A. Tare Weight	A.	158.5	163.6	155.4	154.4	168.1	
B. Wet Wt + Tare Wt	В.	1105.7	1200.3	1101.9	1089.3	1087.4	
C. Dry Wt. + Tare Wt.	C.	914.6	1008.4	941.9	949.8	970.0	
D. Water Weight	B-C	191.1	191.9	160.0	139.5	117.4	
E. Dry Weight	C-A	756.1	844.8	786.5	795.4	801.9	
F. Moisture Content	100*D/E	25.3%	22.7%	20.3%	17.5%	14.6%	
Compaction Data  ASTM D558 □  Method A ⊠	ASTM D 698 [ Method B ]	⊠ AS □ Metho	STM D1557 🔲 d C 💢	gram or .0022 L AASHTO Method D (AS			SHTO T180 E
G. Wt of Soil + Mold	G.	5892	5926				
H. Wt. of Mold	Н.	4282	4282	4282	4282	4282	
I. Wt. of Soil (g. or lbs.		1610	1644	1635	1567	1504	
J. Wt of Soil (Lbs.)	I/453.6 or 1	3.549	3.624	3.604	3.455	3.316	
K. Mold Volume Facto	or K.	30.02	30.02	30.02	30.02	30.02	
L. Wet Density (PCF)	J*K	106.5	108.8	108.2	103.7	99.5	
M. Dry Density (PCF)	L/(1+F)	85.0	88.7	89.9	88.3	86.8	
Sieve Size used to separate t	the Oversize Fracti	on:	#4 Siev		3/8 inch Sieve		3/4 inch Sieve □
Mechanical Rammer	Manual R			Moist Prepa		Dry P	reparation D
References / Comments / D	eviations: *	ND = Not deter	ermined *NI = Ir	nformation was no	t provided		
						- I-AMHAN	
<u>Jennifer Ols</u> Technician Nar		Janage Sign	1 Olse 4/3/13 nature	Cert	MA ification Type/No.		3/25/2013 Date
Kyle Bauco	om ibility	1400	ature	Pro	ject Engineer	• -	4/12/13 Date

Revision Date: 11/21/07

### **Moisture - Density Report**

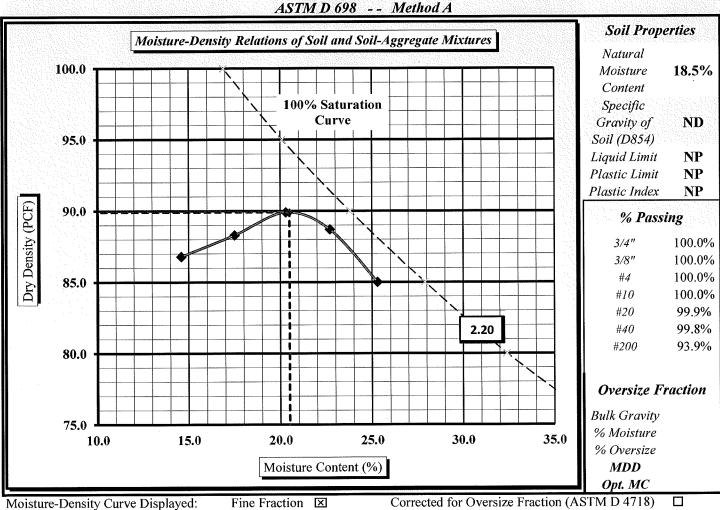


Quality Assurance

S&ME Project #:	1356-11-032	1356-11-032 Phase 03 Marshall Industrial Landfill No. 1 - Cells 3 & 4		Report Date:	4/2/13	
Project Name:	Marshall Industrial La			Test Date(s):	3/21-25/13	
Client Name:	Duke Energy					
Client Address:	526 South Church Str	526 South Church Street, Charlotte, NC 28202				
Boring #:	NI	Sample #:	SG-16	Sample Date:	3/15/2013	
Location:	Cell 3&4 Structural Fill	Offset:	NI	Depth:	Nl	
Sample Descripti	on: Black Gray Silt (	ML) Fly A	sh			

**Maximum Dry Density** 89.9 PCF. **Optimum Moisture Content** 

20.5%



3/4 inch Sieve □ #4 Sieve 区 3/8 inch Sieve □ Sieve Size used to separate the Oversize Fraction: Moist Preparation □ Dry Preparation 🗵 Manual Rammer □ Mechanical Rammer ND = Not determined NI = Information was not provided References / Comments / Deviations: Jennoger & Olsen 4/3/13 Date: 3/25/13 Technician: Jennifer Olsen ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort Project Engineer Kyle Baucom

Technical Responsibility Signature Position This report shall not be reproduced, except in full, without the written approval of S&ME, Inc. Form No: TR-D2216-T265-1

Revision No. 0



Revision I	Date: 02/22/08		·			ter Content			
			STM D 22	and the second and the second second second	AASHTO T 2	LEAST THE WARREN	recontrate assistant for 2000	ality Assurance	
				soutnern Pine	Boulevaru ~	Charlotte, NO Report D		4/19/13	
Project #		6-11-032 Ph		U.N. 1 (C.11. 2	0.4			4/17-19/13	
Project N			al Landfil	I No.1 -Cells 3	4	Test Date	(S):	4/1/-19/13	
Client Na		e Energy		31 1 4 NG 3	10000				
Client Ac			h Street, C	Charlotte, NC 2	.8202	Cample Date	·/a)•	4/16/13	NS.841
Sample b	<u> </u>	e Baucom				Sample Date Drill R		NA	
	g Method:	NA 🗆	<b>.</b>		Balance ID.	3222	Calibration		12
Metho Boring	d: A (1% Sample	Sample	B (0.1		Tare Wt.+	Tare Wt. +	Water	Percent	N
No.	No.	Depth	Tare #	Tare Weight	Wet Wt	Dry Wt	Weight	Moisture	
		ft. or m.		grams	grams	grams	grams	%	e
NA	SG-17	NA	T-8	81.60	343.87	297.42	46.45	21.5%	
	A A MANAGEMENT								
	***								
							****		
									100 S S S S S S S S S S S S S S S S S S
	A HARMAN								
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	viations / Refere								
	nperature Set at								
No baggio	e or jar sample	provided.				- 30000000			
						LILLANDON		•	
ASTM D	2216: Laborate	ory Determinat	tion of Wa	ter (Moisture) C	ontent of Soil a	and Rock by Mas	38		
	Karen War Technician No	ner	9X	Signature		NICET 1179 Certification Type	900	4/24/ Date	1/3

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**Project Engineer** 

Kyle Baucom Technical Responsibility

### Form No. TR-D422-2

## Particle Size Analysis of Soils

**S&ME** 

Revision No. 0

Revision Date: 02/20/08

ASTM D 422

S&ME, Inc.  $\sim 9751$  Southern Pine Boulevard  $\sim$  Charlotte, NC 28273

4/24/13

Report Date:

1356-11-032 Phase 03

Project #:

 $\overline{K} \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 99.5% Diameter %0.001 %6.66 %6.66 91.5% 0.04955 0.03588 0.02398 0.00772 0.00387 0.00164 100.0% 100.0% 100.0% 100.0% 0.01092 97.5% 0.01491 **D**= Percent Passing 40 g./ Liter 3/25/2012 Soil Mortar Table 3 0.01562 100.0% 0.01562 (washed) 99.5% 91.5% 0.01562 0.01562 0.01562 0.01553 0.01553 %6.66 0.01553 %6.66 97.5% Pan# Weathered & Friable × Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H Effective Depth 4.14 9.01 15.6 16.0 0.03 0.05 0.26 1.24 11.8 14.7 14.8 0.0310.1 13.7 0.0 0.0 0.0 0.0 0.0 Px % Passing #10 Sieve #100 #200 1.5" 3/4" 1/2" 3/8" #20 #40 09# 1.0" #10 #4 P (total) = 78.1% 61.3% 35.7% 22.3% 20.1% 10.0% 84.7% 3.3% 3901 Soft 151H Percent Passing 526 South Church Street, Charlotte, NC 28202 215.82 21.5% 297.42 Natural 343.87 46.45 81.60 2.200 T-8 4/16/13 ŇĀ \*Cell 3&4 Structural Fill, Grid B1 1 min. ID No. (Rxa/W)x100 × Apparent Relative Density (Assumed) P(-#10) =Hygroscopic 84.8% 78.1% 61.3% 35.7% 22.3% 20.1% 10.0% 3.3% 2.31% Type: 27.15 0.26 27.41 15.91 Hard & Durable Dispersion Time: 4/17-24/13 Sample Date: Hydrometer: Elevation: Hydrometer % Moisture (100 x D/E) (C-A) Water Wt. (B-C) 35.00 38.00 27.50 16.00 10.00 9.00 4.50 1.50 Moisture Content Dry Wt. + A Wet Wt. + A Test Date(s): Tare Wt. Tare# Dry Wt. × Composite Correction 6/25/2012 Address: Angular Corrections Д B Ö Щ ď SG-17 Marshall Industrial Landfill No. 1 Cells 3&4 X ASTM D 422, D 2487, D 4318 Cylinder Control Cal. Date: 5.0 100.0% 266.03 Composite Correction 5.0 5.0 5.0 5.0 5.0 5.0 5.0 266.03 260.02 50.00 48.87 1.09 Sample #: Offset: Rounded Hydrometer Reading 43.0 40.0 21.0 15.0 14.0 32.5 9.5 Beaker #: Sample Description: Black Gray Silt (ML) Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 3222 X Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations (0.5 °C) \*See Below Temp. 22.0 22.0 22.0 22.0 22.5 22.5 22.0 Correction Factor a (Table 1):  $\times$ ID No. Total Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: NA Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 30 9 15 a S Boring #: ocation: Pan #:

Karen Warner Technician Name

S&ME, Inc. - Corporate

Oven Temperature was set at 60C.

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900 Certification #

1356-11-032 Phase 03 SG-17 Hydro.xls

Project Engineer

Page 1 of 1

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

DOMNIE.	. 1nc. ~ 9/5	l Southern Pine B	ouievaru ~	Charione	, 140 404/3

S&ME Project #:	1356-11-032 Phas	e 03	Report Date:	4/24/13
Project Name:	Marshall Industria	ıl Landfill No. 1 Cells 3&4	Test Date(s):	4/17-24/13
Client Name:	Duke Energy			
Address:	526 South Church	Street, Charlotte, NC 28202		
Boring #:	NA	Sample #: SG-17	Sample Dat	te: 4/16/13
Location:	*See Below	Offset: NA	Elevatio	n: NA

Black Gray Silt (ML) Sample Description: 1.5" 1" 3/4" 1/2" 3/8" #10 #20 #40 #100 #200 #60 Percent Passing 0.001 0.01 100 10 0.1 Particle Size (mm)

Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425  mm and > 0.075  mm (#200)
- Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm
N. J. 1. 1	G: #00	0.00/	C:1+ 77 50/

Gravel: 0.0%Silt 77.5% Maximum Particle Size: #20 Total Sand: 8.5% Clay 14.0% Silt & Clay (% Passing #200): 91.5% Moisture Content 21.5% Colloids 2.200 ent Relative Density (Assumed) NP Plastic Index NP NP Plastic Limit Liquid Limit Medium Sand: 0.1% Fine Sand: 8.4% 0.0% Coarse Sand: Weathered & Friable □ Description of Sand and Gravel Rounded Angular X Hard & Durable Soft 40 g./ Liter Sodium Hexametaphosphate: Dispersion Period: I min. Dispersing Agent: Mechanical Stirring Apparatus A

References / Comments / Deviations: ASTM D 4318, D 854, D 2487

Technician Name: / Au Walley Date: 4/24/13

Kyle Baucom
Technical Responsibility

Signature Project Engineer
Position

### Form No. TR-D4318-T89-90



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 AASHTO T 90 ASTM D 4318 AASHTO T 89 Quality Assurance Another code S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 4/24/13 Report Date: 1356-11-032 Phase 03 Project #: 4/17-24/13 Marshall Industrial Landfill No.1 - Cells 3 & 4 Test Date(s) Project Name: Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC 28202 Client Address: Sample #: SG-17 Sample Date: 4/16/13 Boring #: NA Elevation: NA \*See Below Offset: NA Location: Black Gray Silt (ML) Sample Description: Type and Specification S&ME ID # Cal Date: S&ME ID# Cal Date: Type and Specification 27704 2/4/2013 6/25/2012 Grooving tool 3222 Balance (0.01 g) 3653 2/26/2013 Grooving tool LL Apparatus 2/4/2013 Grooving tool 10844 Oven Liquid Limit Plastic Limit Pan# Tare #: Tare Weight A Wet Soil Weight + A B Dry Soil Weight + A C Water Weight (B-C) D Dry Soil Weight (C-A) E % Moisture (D/E)\*100 F N # OF DROPS Moisture Contents determined by ASTM D 2216 LL = F \* FACTORLL Ave. Average One Point Liquid Limit 65.0 **Factor** Factor 1.005 60.0 20 0.974 26 0.979 27 1.009 21 55.0 % Moisture Content 0.985 28 1.014 22 50.0 0.99 29 1.018 23 45.0 24 0.995 30 1.022 1.000 40.0 NP, Non-Plastic  $\times$ 35.0 Liquid Limit 30.0 Plastic Limit 25.0 Plastic Index Group Symbol ML 20.0 100 10 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method V Estimate the % Retained on the #40 Sieve: **Dry Preparation** Air Dried Wet Preparation Notes / Deviations / References: \*Cell 3 & 4 Structural Fill, Grid B1

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Karen Warner Technician Name

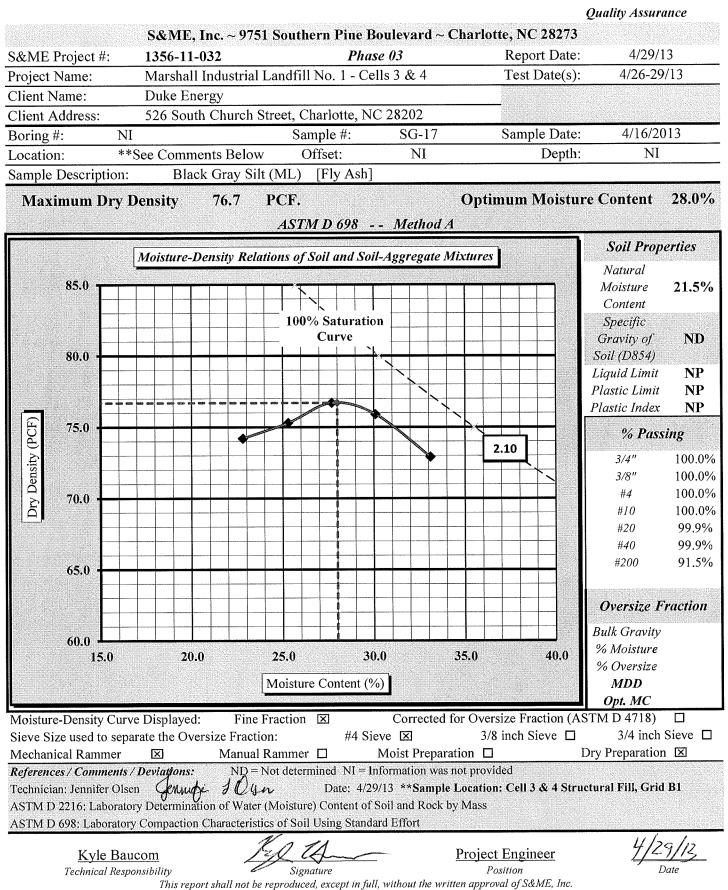


Kyle Baucom Technical Responsibility

Revision Date: 11/21/07

### **Moisture - Density Report**





Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

<u> </u>	356-11-032		Phase		Report D		4/29/13
Project Name: M	larshall Industrial	Landfill No.	1 - Cells 3 &	. 4	Test Dat	te(s)	4/26-29/13
	uke Energy						
Client Address: 52	26 South Church S			)2			
Boring #: N	1	Sa	mple #:	SG-17	Sample D		4/16/2013
Location: *:	*See Comments B		Offset:	NI	De	pth:	NI
Sample Description:		y Silt (ML)	[Fly Ash]				
Type and Specification				e and Specificati		ME ID #	Cal Date:
Balance (0.1 g)	22182			npaction Mold		20116	2/4/2013
Balance	22182			npaction Hamme		20222	6/6/2012
Straightedge	27711 10939		/2013 Ove 2013	en –		22151	4/4/2013
Sieve #4				) Laram Daadak	ility)	Check:	
Water Content ASTM D2216 □		ent requires € TO T265 □	ir z daiance ((	0.1 gram Readab ASTM D4959			□ D4643
A31W D2210 D	Water Added:	600	550	500	450	=400 (32)	
The state of the s	Tare #:	5L	5C	6911	HK	JC	7
A. Tare Weight	A.	156.5	156.4	155.4	160.4	164.8	
B. Wet Wt + Tare V		1220.9	1124.4	976.6	1166.2	985.6	
C. Dry Wt. + Tare V		956.4	900.7	798.5	963.2	833.1	
D. Water Weight	B-C	264.5	223.7	178.1	203.0	152.5	
E. Dry Weight	C-A	799.9	744.3	643.1	802.8	668.3	
F. Moisture Conte		33.1%	30.1%	27.7%	25.3%	22.8%	
Compaction Data	200000000000000000000000000000000000000		l	gram or .0022 L		Check:	
ASTM D558	ASTM D 698		TM D1557 🗆	AASHTO			SHTO T180
Method A ⊠	Method B				STM 1978) 🗆	AASE	ITO Method D
G. Wt of Soil + Mo	ld G.	5746	5772	5759	5705	5657	
H. Wt. of Mold	Н.	4280	4280	4280	4280	4280	
1. Wt. of Soil (g. or	lbs.) G-H	1466	1492	1479	1425	1377	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.232	3.289	3.261	3.142	3.036	
K. Mold Volume Fa	actor K.	30.02	30.02	30.02	30.02	30.02	
L. Wet Density (PCF		97.0	98.7	97.9	94.3	91.1	
M. Dry Density (PC		72.9	75.9	76.7	75.3	74.2	
Sieve Size used to separ Mechanical Rammer	ate the Oversize Fract	ion:	#4 Siev		3/8 inch Sieve		3/4 inch Sieve eparation
References / Comments			rmined *NI = Ir	nformation was no	t provided		

Jennifer Olsen Technician Name

Certification Type/No.

4/29/2013

Kyle Baucom

Technical Responsibility

Project Engineer

Position

Form No: TR-D2216-T265-1

Revision No. 0



Revision I	Date: 02/22/08	La	boratory	Determina	ILIUII UI VVA	ter Conten			
		A	ISTM D 22	16	AASHTO T 2	265	Qu	ality Assurance	'
		S&ME, Inc	. ~ 9751 S	Southern Pine	Boulevard ~	Charlotte, N	C 28273		
Project :	#: 1350	6-11-032		Pł	nase 03	Report I	Date:	5/24/13	
Project N	Name: Mar	shall Industri	al Landfil	l No.1 - Cells	3 & 4	Test Dat	e(s):	5/15-20/13	
Client N		e Energy							
Client A			h Street, C	Charlotte, NC 2	28202				
Sample b		Baucom				Sample Dat		5/13/13	
	g Method:	NI				Drill 1		NI	
Metho	d: A (1%	) [	B (0.1	%) 🗸	Balance ID.	3222	Calibration l	Date: 6/25/1	-
Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	N o t
		ft. or m.		grams	grams	grams	grams	%	e
	SG-18		79	72.28	433.08	361.06	72.02	24.9%	
									+
								-	-
			-						-
						.,			-
									-
						,	-		
Notes / De	viations / Referen	ices NI =	= Informati	on not provid <b>e</b> d					
ASTM D	2216: Laborato	rv Determinati	on of Wate	er (Moisture) Co	ntent of Soil ar	nd Rock by Mas	SS		
		,	0	. 1		11/1			
	Jennifer Ols Technician Nan		_Jen	noty. FOG.	K	Certification Type	·/No.	<u>5/24/201</u> Date	<u>3</u>
	Kyle Bauco Technical Responsi		Fyl	Signature	_	Staff Profession	ional	5/28/1 Date	13
		This report sho	all not be repi	oduced, except in fi	ull, without the wr	itten approval of Sc	&ME, Inc.		

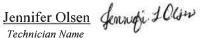
### Form No. TR-D4318-T89-90



Revision No. 0 Liquid Limit, Plastic Limit, and Plastic Index Revision Date: 11/20/07 ASTM D 4318 X AASHTO T 89 AASHTO T 90 Another code Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Phase 03 Project #: 1356-11-032 Report Date: 5/24/13 Marshall Industrial Landfill No. 1 - Cells c & 4 5/15-21/13 Project Name: Test Date(s) Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample #: SG-18 Boring #: NI Sample Date: 5/13/13 Location: \*\*See Below Offset: NI Elevation: NI Sample Description: Gray Silt (ML) [Fly Ash] Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) Grooving tool LL Apparatus Grooving tool Oven Grooving tool Liquid Limit Pan # Plastic Limit Tare #: Tare Weight Α В Wet Soil Weight + A  $\mathbf{C}$ Dry Soil Weight + A D Water Weight (B-C) Dry Soil Weight (C-A) E  $\mathbf{F}$ % Moisture (D/E)\*100 N # OF DROPS Moisture Contents determined LL = F \* FACTORby ASTM D 2216 LL Ave. Average One Point Liquid Limit 65.0 Factor N Factor 60.0 20 0.974 26 1.005 21 0.979 27 1.009 55.0 Moisture Content 22 0.985 28 1.014 50.0 0.99 29 23 1.018 45.0 24 0.995 1.022 1,000 25 40.0 NP, Non-Plastic X 35.0 % Liquid Limit 30.0 **Plastic Limit** 25.0 Plastic Index 20.0 **Group Symbol** ML 10 100 15 20 25 30 35 40 # of Drops Multipoint Method 1 One-point Method **Dry Preparation** 1 Air Dried Estimate the % Retained on the #40 Sieve: Wet Preparation Notes / Deviations / References: NI = No information provided. \*\*Sample Location: Cell 3 & 4 Structural Fill, Grid C2

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Technician Name



5/24/2013

Kyle Baucom Technical Responsibility

Revision Date: 02/20/08

### Particle Size Analysis of Soils

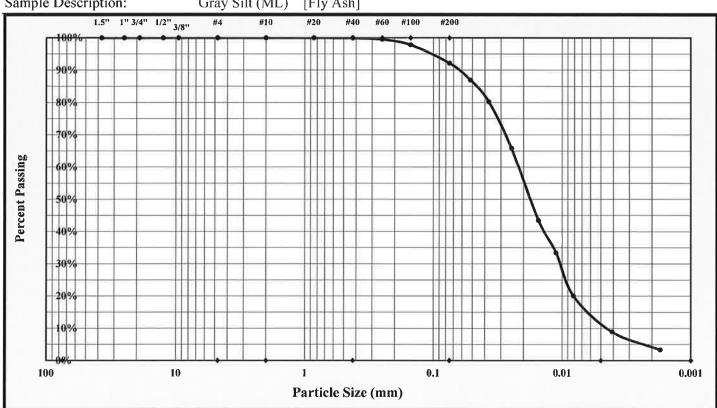


ASTM D422

**Ouality Assurance** 

			Q.	inity 2133Williec	
	S&ME, Inc. ~ 975	1 Southern Pin	e Boulevard ~	Charlotte, NC 28273	
S&ME Project #:	1356-12-021 Phase	1356-12-021 Phase 01			5/24/13
Project Name:	Marshall Ind. LF N	Marshall Ind. LF No.1 - Cells 3 & 4			5/15-24/13
Client Name:	Duke Energy				
Address:	526 S. Church St., 0	Charlotte, NC 28	3202		
Boring #:	NI	Sample #:	SG-18	Sample Date	e: 5/13/13
Location:	**See Below	Offset:	NI	Elevation	n: N1

Sample Description: Gray Silt (ML) [Fly Ash]



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)			
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm			
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm			
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm			
Maximum Particle Size: #40		Gravel: 0.0%	Silt 80.7%			

Maximum Particle Size.	#40	Giavei.		0.070			SIII	OU. / 70	
Silt & Clay (% Passing #200):	92.2%	Total Sand:		7.8%	8%		Clay	11.5%	
ent Relative Density (Assumed)	2.100	Moisture Content		24.9%	Colloids		ND		
Liquid Limit	NP	Plastic Limit		NP	NP		stic Index	NP	
Coarse Sand:	0.0%	Medium Sand:		0.1%		F	ine Sand:	7.8%	
Description of Sand and Gravel	Rounded	Angular ⊠	Hard & Dur	rable 🗵	Soft		Weathered	& Friable □	Ξ
Mechanical Stirring Apparatus A	Dispersion Per	riod: 1 min.	Dispersing A	gent: Soc	lium Hexa	ımetap	hosphate:	40 g./ Liter	

ASTM D 4318, D 854, D 2487 \*\* Sample Location: Cell 3&4 Structural Fill NI = No information provided. References / Comments / Deviations:

Technician Name: Jennifer Olsen Date: 5/24/13

Kyle Bancom Technical Responsibility Signature

Staff Professional Position

### Form No. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

Particle Size Analysis of Soils



ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

5/24/13

5/15-24/13

Test Date(s): Report Date:

Marshall Ind. LF No.1 - Cells 3 & 4

Project Name:

Project #:

1356-12-021 Phase 01

 $K \times ((L/T)^{1/2}$ 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 100.0% 0.001 Diameter 0.01114 0.00816 0.00410 %0.00I %5'66 %8.76 0.05164 0.02484 0.01534 %6.66 92.2% 0.00173 0.03741 Percent Passing 40 g./ Liter 3/25/2012 Soil Mortar 100.0% (washed) 100.0% 92.2% Table 3 0.01641 %8.76 0.01641 0.01641 0.01641 %6.66 99.5% Pan# 0.01641 0.01641 0.01641 0.01641 Weathered & Friable × Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H Effective Depth 1.10 0.00 0.00 0.04 0.24 3.91 10.4 11.5 13.8 14.8 15.6 16.0 0.0 0.0 0.0 0.0 0.0 6.6 13.1 NI = No information provided. ND = Not determined. Sieve Px % Passing #10 #100 #200 1/2" 3/8" #10 #20 #40 1.5" 1.0" 3/4" 09# #4 P (total) = %6.98 80.2% 65.7% 43.5% 33.4% 20.1% %6.8 3901 3.3% Soft 151H Percent Passing 288.78 24.9% Natural 72.28 433.08 361.06 72.02 2.100 526 S. Church St., Charlotte, NC 28202 6/ 5/13/13 Z 1 min. ID No. (Rxa/W)x100 × Apparent Relative Density (Assumed) Hygroscopic P(-#10) =%6.98 80.2% 65.7% 43.5% 33.4% 20.1% 8.9% 3.3% 0.38% 26.70 26.66 10.62 16.04 Type: 0.04 XX Hard & Durable Dispersion Time: Sample Date: Elevation: Hydrometer: Hydrometer % Moisture  $(100 \times D/E)$ Water Wt. (B-C) (C-A) 36.00 29.50 19.50 39.00 15.00 1.50 Moisture Content 9.00 4.00 Wet Wt. + A Dry Wt. + A Tare Wt. Tare# Dry Wt. × Composite Correction 6/25/2012 Address: Angular Corrections Q Ы B C Ø SG-18 ASTM D 422, D 2487, D 4318 ΙŻ Cylinder Control Cal. Date: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 Composite Correction 4.0 %0.00I 371.90 371.90 370.50 50.00 49.81 0.00 SW 9 Sample #: Offset: \*\*Sample Location: Cell 3 & Structural Fill, Grid C2 [Fly Ash Rounded Hydrometer B Reading 43.0 40.0 33.5 23.5 13.0 19.0 8.0 Beaker #: Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 3222 Sample Description: Gray Silt (ML)  $\times$ Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: \*\*See Below Duke Energy References / Comments / Deviations (0.5°C) Temp. 21.5 21.5 21.5 21.5 21.5 21.5 21.5 21.5 Correction Factor a (Table 1): × ID No. Total Sample Oven Dried: an Tare Weight (grams): Stirring Apparatus: Z Control Cylinder Hydrometer Jar #: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 09 15 30 Boring #: \_ocation: a S Pan #:

Jung. 2022 5/34/13 Signature/Date Jennifer Olsen Technician Name

Technical Responsibility Kyle Baucom

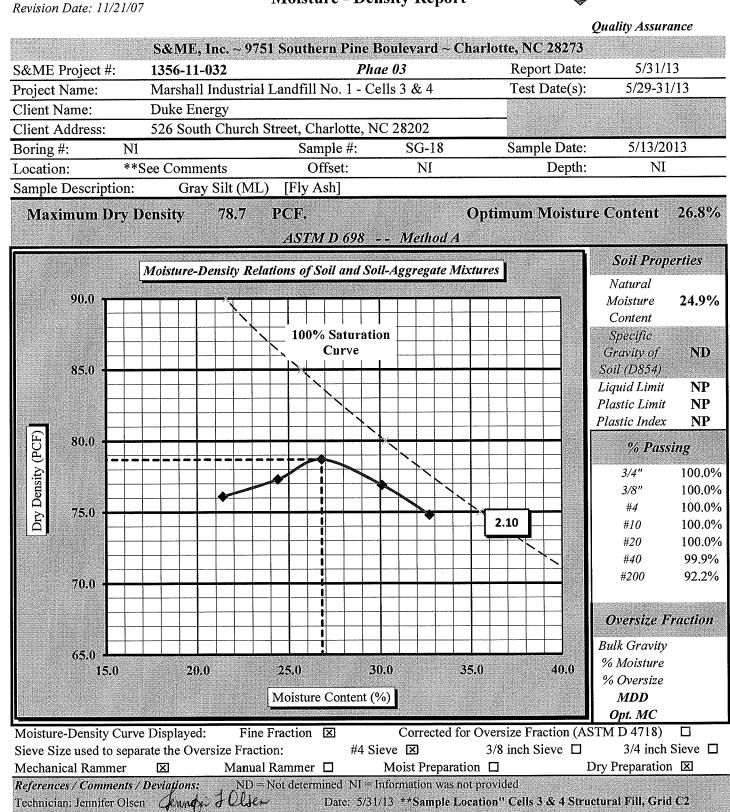
3201 Spring Forest Road Raleigh, N.C. 27616

1356-11-032 Phase 03 SG-18 Hydro.xlsx

Staff Professional

### **Moisture - Density Report**





ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM D 698; Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom

Signature

Staff Professional Position

Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

Revision Date: 11/21/07

### **Moisture - Density Relationship**



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

S&	ME, Inc.	~ 9751 South	ern Pine Bou	ilevard ~ Cha	ırlotte, NC 28	<b>2</b> 73		
Project #: 1356-11	-032	032 Phae 03			Report D	ate:	5/31/13	
Project Name: Marshal	l Industria	l Landfill No.	1 - Cells 3 &	4	Test Dat	te(s) 5/	29-31/13	
Client Name: Duke Er	Duke Energy							
Client Address: 526 Sou	th Church	Street, Charlo	otte, NC 2820	2				
Boring #: NI		Saı	mple #:	SG-18	Sample D	oate: 5	/13/2013	
Location: **See C	omments	C	Offset:	NI	De	pth:	NI	
Sample Description:	Gray Silt	· · · - ·						
Type and Specification	S&ME II		· · · · · · · · · · · · · · · · · · ·	and Specificat		ME ID #	Cal Date:	
Balance (0.1 g)	22182			paction Mold		20116	2/4/2013	
Balance	22182			paction Hamm		20222	6/6/2012	
Straightedge	27711			n		22151	4/4/2013	
Sieve #4	10939			.1 gram Readal	:114. \\	Check:		
Water Content ASTM D2216 ⊠		nent requires ⊖ TO T265 □	r 2 Dalaile (U	, r gram Keadat ASTM D4959			04643 □	
	er Added:	150	200	250	300	350	У4042 Ш	
	Tare #:	5B	13	MJD	JRC	5F		
A. Tare Weight	A.	159.9	156.8	160.4	157.7	160.2		
B. Wet Wt + Tare Wt	В.	1047.4	1171.0	1121.7	1108.6	1162.6		
C. Dry Wt. + Tare Wt.	C.	891.0	972.3	918.7	888.7	915.4		
D. Water Weight	B-C	156.4	198.7	203.0	219.9	247.2		
E. Dry Weight	C-A	731.1	815.5	758.3	731.0	755.2		
F. Moisture Content	100*D/E	21.4%	24.4%	26.8%	30.1%	32.7%		
Compaction Data				ram or .0022 L	L	Check:		
-	STM D 698		IM D1557 □	AASHTC			ITO T180 □	
Method A ⊠	Method B				STM 1978) 🗆		O Method D	
G. Wt of Soil + Mold	G.	5675	5733	5787	5790	5778		
H. Wt. of Mold	H.	4279	4279	4279	4279	4279		
I. Wt. of Soil (g. or lbs.)	G-H	1396	1454	1508	1511	1499		
	53.6 or I	3.078	3.205	3.325	3.331	3.305		
K. Mold Volume Factor	K.	30.02	30.02	30.02	30.02	30.02		
L. Wet Density (PCF)	J*K	92.4	96.2	99.8	100.0	99.2		
M. Dry Density (PCF)	L/(1+F)	76.1	77.3	78.7	76.9	74.8		
Sieve Size used to separate the C Mechanical Rammer		tion:	#4 Sieve	1	3/8 inch Sieve		'4 inch Sieve □ aration ⊠	
References / Comments / Deviat	ions:	*ND = Not deter	mined *NI = In	formation was no				

Jennifer Olsen

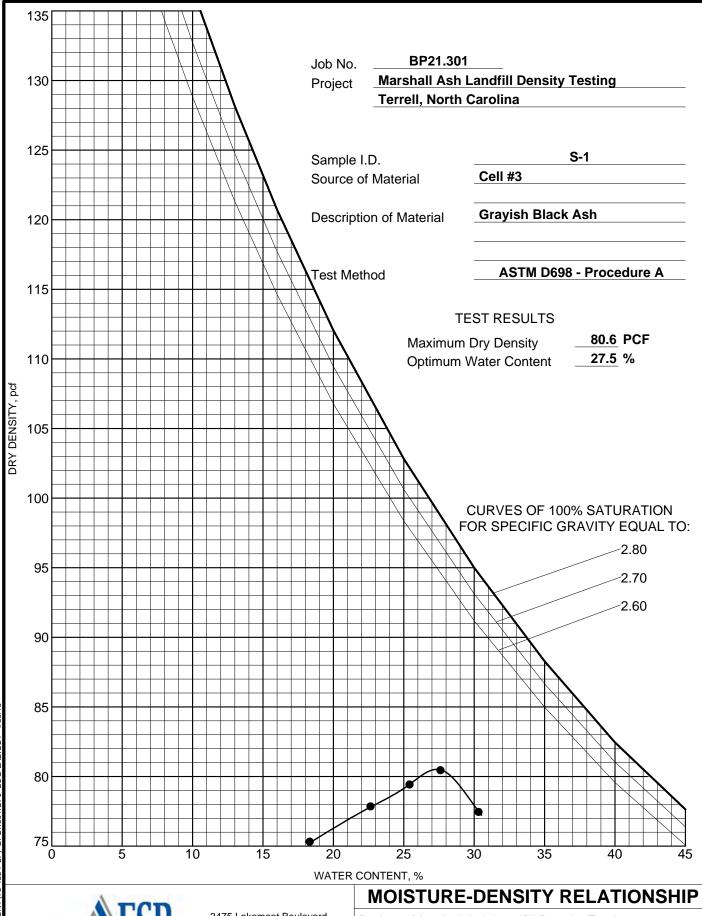
Technician Name

Technical Responsibility

Certification Type/No.

5/31/2013

Kyle Baucom





3475 Lakemont Boulevard Fort Mill, South Carolina Telephone: 803.802.2440 Fax: 803.802.2515

Project: Marshall Ash Landfill Density Testing

Location: Terrell, North Carolina

Number: BP21.301

### **Moisture - Density Relationship**

Test Methods ASTM D 698, D 1557, D2216, AASHTO T99, T180, T265



Project No: E4-BP21.301	Project Nar	me:						
Lab No: 3960	Marshall As	sh Landfill			Date: 4/29/2	2013		
Sample No: S-1, Cell #3					Tech: T. Su	mmers		
*Soil Description: Grayish Black As	h							
Type and Specification ESP ID#	Cal. Date	: T <u>j</u>	ype and Spe	cification	ESP ID#	Cal. E	)ate:	
Balance (0.1 g) C-1B	1/30/	2013	Compactio	n Mold	6A	-4		1/18/2013
Balance E-1C	1/30/	2013	Compactio	n Hammer	7A	-2		9/7/2012
Straightedge 8C	1/16/	2013	Oven		ESF	P- <u>2</u>		2/1/2013
Sieve #4 3G	9/30/	2012						
Proctor Method Determination	D698 Meth	od A						
Proctor Workout	Date: 4/27/2013		Tech: T. Summer	·s				
Point Number		2	3	4	5	6	7	8
Weight Soil and Mold (g)		5658	5720	5766	5740		-	
Weight of Proctor Mold (g)		4220	4220	4220	4220			
Weight of Soil in Mold (g)	1	1438	1500	1546	1520			1
Weight of Soil in Mold (lbs)		3.170	3.307	3.408	3.351			
Volume of Mold (cu.ft.).0001		0.0332	0.0332	0.0332	0.0332			1
Wet Unit Weight (pcf)		95.5	99.6	102.7	100.9			
Moisture Can No								1
Weight of Can	85.65	79.58	79.51	87.36	81.45			
Weight of Wet Soil & Can	586.75	674.25	697.48	646.3	639.11			
Weight of Dry Soil & Can		565.98	572.29	525.4	509.41			
Weight of Water		108.27	125.19	120.9	129.7			
Weight of Dry Soil		486.4	492.78	438.04	427.96			
Moisture Content (%)		22.26%	25.40%	27.60%	30.31%			
Dry Unit Weight (pcf)	75.3	78.1	79.4	80.5	77.5		<u> </u>	
Comments: Tony Summers Technician Name	-	Anthony	M. Sums	ners	AMRL - N/A			4/29/2013 Date
1 commont i vario		Cignature			Continoution	ypc/140.		Dato

Signature

Sr. Project Engineer

Position

4/29/2013

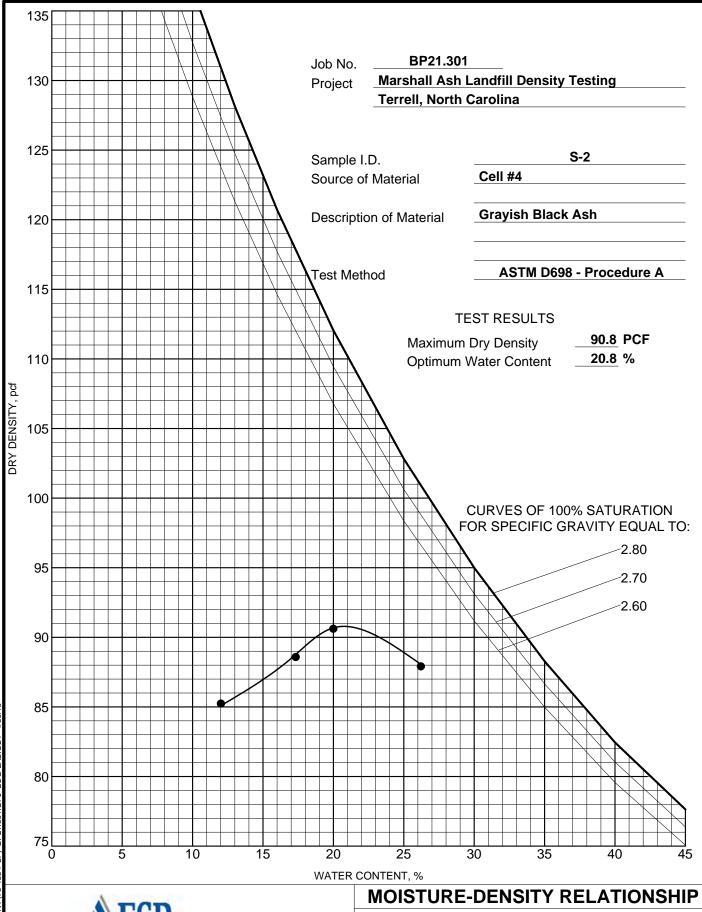
Date

Form ESP-L-01.04\_\_Rev. 03\_\_7/24/09

David A. Bixler II, PE

Technical Responsibility

Moisture-Density Relationship





3475 Lakemont Boulevard Fort Mill, South Carolina Telephone: 803.802.2440 Fax: 803.802.2515

Project: Marshall Ash Landfill Density Testing

Location: Terrell, North Carolina

Number: BP21.301

ESP COMPACTION1 (75-135 PCF)

### **Moisture - Density Relationship**

### Test Methods ASTM D 698, D 1557, D2216, AASHTO T99, T180, T265



Project No: E4-BP21.301	Project Na	me:						
Lab No: 3961	Marshall A	sh Landfill			Date: 4/26/20	013		
Sample No: S-2, Cell #4					Tech: T. Sun	nmers		
*Soil Description: Grayish Black As	sh							
Type and Specification ESP ID#	Cal. Date	: T	ype and Spe	cification	ESP ID#	Cal. E	Date:	
Balance (0.1 g) C-1B	1/30/	/2013	Compactio	n Mold	6A-4	4		1/18/2013
Balance E-1C	1/30/	/2013	Compactio	n Hammer	7A-2	2		9/7/2012
Straightedge 8C	1/16/	/2013	Oven		ESP-	-2		2/1/2013
Sieve #4 3G	9/30/	/2012						
Proctor Method Determination	D698 Meth	od A						
	Date:		Tech:					
Proctor Workout	4/25/2013	1	T. Summer				ı	
Point Number	ł	2	3	4	5	6	7	8
Weight Soil and Mold (g)	5649	5783	5851	5891				
Weight of Proctor Mold (g)	4220	4220	4220	4220				
Weight of Soil in Mold (g)	1429	1563	1631	1671				
Weight of Soil in Mold (lbs)	3.150	3.446	3.596	3.684				
Volume of Mold (cu.ft.).0001	0.0332	0.0332	0.0332	0.0332				
Wet Unit Weight (pcf)	94.9	103.8	108.3	111.0				
Moisture Can No								
Weight of Can	87.69	87.85	81.69	85.8				
Weight of Wet Soil & Can	749.49	688.3	669.38	805.83				
Weight of Dry Soil & Can	683.18	596.05	573.79	656.29				
Weight of Water		92.25	95.59	149.54				
Weight of Dry Soil		508.2	492.1	570.49				
Moisture Content (%)	11.14%	18.15%	19.42%	26.21%	<b> </b>			+
Dry Unit Weight (pcf)	85.4	87.8	90.7	87.9				
Comments: Tony Summers Technician Name	-	Anthony Signature	M. Sums	ners	AMRL - N/A Certification	Type/No.		4/26/2013 Date
David A. Bixler II, PE Technical Responsibility	-	Signature	Q <sub>E</sub>		Sr. Project E Positi			4/26/2013 Date

Form ESP-L-01.04\_\_Rev. 03\_\_7/24/09

Moisture-Density Relationship

### Cells 1 & 2 Operations Laboratory Test Results



Revision Date: 11/21/07

### Moisture - Density Report



				on of lander of court and reaching the sections	Quality Assurance
&ME Project#:	S&ME, Inc. 1356-11-016	- 9751 Southern Pine I	Soulevard ≈ Cha ise 1	rlotte, NC 28273. Report Date:	8/24/11
roject Name:	177 St. Santa Land St. L.	m Station-Landfill Testin		Test Date(s):	8/22-24/11
lient Name:	Duke Energy	In Otation Landin 1991	<u>B</u> 02. 13.00		
lient Address:	Terrell, NC				
oring#:	NA	Sample #:	S-1	Sample Date:	8/10/2011
ocation:	Cell 2-D9	Offset:	NA	Depth:	Bulk
ample Description	n: Fly Ash				
Maximum/Di	y Density 78	ASTM D 698		ptimum Moistui	e Content 32.8%
	Moisture-Den	sity Relations of Soil and S	oil-Aggregate Mix	dures	Natural
85:0:					Moisture ND
					Content
					Specific Gravity of ND
80.0			3*	10000000000000000000000000000000000000	Soil -
					Liquid Limit NO
					Plastic Limit ND
(PCP)			2.2		Plastic Index ND
É E					% Passing
Density					3/4"
a H			$\forall \Box \Box \Box$		3/8"
含 70.0 士				1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	#10
4					#40
					#60
65.0					#200
					the state of the s
, A					Oversize Fraction
60.0					Bulk Gravity
15.0	-20.0 25	.0 30.0 35.0	40.0	45.0 50.0	% Moisture
		Moisture Content (%	6)	*	% Oversize MDD
and the same of the same of	indirection de la		Markin esignikasan kandingan	Halana 24 i	Opt. MC
foisture-Density C	and the desired the complete of the complete o	Fine Fraction 🗵	The state of the s	Oversize Fraction (A	
	eparate the Oversize	27 A May 17 S A M 1 A M	ieve 🗵	3/8 inch Sieve	3/4 inch Sieve
fechanical Ramme eferences / Comme	the state of the s	Nanual Rammer □	Moist Preparation	1 (A)	Dry Preparation □
ejerences / Comme iven Temperature s	The second of th			A Company	Te for the second
STM D 2216 Labo	arory Determination o	f Water (Moisture) Content of	Soil and Rock by M		the way to express the second
STMD 698 Habor	lory Completion Cha	acteristics of Soll Using Stand	ard Effort	the state of the same of the same	and the state of t

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Signature

Staff Professional

Pasition

William Harrison

Technical-Responsibility

Date

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Project #:	1356-11-016		Phase	e <b>1</b>	Report I	Date:	8/24/11
Project Name:	Marshall Steam S	tation-Landfil	l Testing Serv	vices	Test Da	te(s) 8/	22-24/11
Client Name:	Duke Energy						
Project Address:	Terrell, NC					:	
Boring #:	NA	Sa	mple #:	S-1	Sample D	Oate: 8,	/10/2011
Location:	Cell 2-D9		Offset:	NA	De	pth:	Bulk
Sample Description	n: Fly Ash						
Type and Specification	on S&ME 1.	D# Cal I	Date: Typ	e and Specificat	ion S&	ME ID #	Cal Dote:
Balance (0.1 g)	22183	2 6/8/3	2011 Con	npaction Mold	-	20231	12/29/2010
Balance	22182		2011 Con	npaction Hamm	er 2	20222	6/6/2011
Straightedge	2012		/2011 Ove	ะถ		10844	7/25/2011
Sieve	3599		/2011				
Water Content		= = = = = = = = = = = = = = = = = = =	GP 2 Balance (0	).1 gram Readal	-	Check:	
ASTM D2216		ITO T265 🗆	T	ASTM D4959		ASTM I	04643 □
	Water Added:						
	Tare #:	EL	JLG	MDJ	G	JRC	В
A. Tare Weight	Α.	161.5	162.5	180.0	157.4	156.0	156.7
B. Wet Wt + Tare	Wt B.	726.0	870.6	672.5	704.2	680.0	988.7
C. Dry Wt. + Tare	Wt. C.	631.7	731.1	566.7	569.2	545.3	761.3
D. Water Weight	В-С	94.3	139.5	105.8	135.0	134.7	227.4
E. Dry Weight	C-A	470.2	568.6	386.7	411.8	389.3	604.6
F. Moisture Conte	e <b>at</b> 100*D/E	20.1%	24.5%	27.4%	32.8%	34.6%	37.6%
Compaction Data	Requires	a GP 5 Balance	for ASTM (1	gram or .0022 L	b. readability).	Check:	
ASTM D558 □	ASTM D 698	ĭ AS	TM D1557 🗆	AASHTO	T99 □	AASH	TO T180 🔲
Method A ⊠	Method B	☐ Method	С	Method D (A	STM 1978) 🗆	AASHT	O Mcthod D 🔲
G. Wt of Soil + Mo	old G.	5520	5579	5617	5711	5780	5700
H. Wt. of Mold	H.	4254	4254	4254	4254	4254	4254
1. Wt. of Soil (g. or	· lbs.) G-H	1266	1325	1363	1457	1526	1446
J. Wt of Soil (Lbs.)	) I/453.6 or 1	2.791	2.921	3.005	3.212	3.364	3.188
K. Mold Volume F	actor K.	30.16	30.16	30.16	30.16	30.16	30.16
L. Wet Density (PC	F) J*K	84.2	88.1	90.6	96.9	101.5	96.2
M. Dry Density (P	CF) L/(1+F)	70.1	70.8	71.1	73.0	75.4	69.9
Sieve Size used to sepa		tion:	#4 Sieve	×	3/8 inch Sieve	□ 3/	4 inch Sieve □
Mechanical Ramme		Rammer 🏻		Moist Prepa	aration 🗵	Dry Prep	aration 🗆
References / Comment		ASTM D 4318,	D 854, D 2487,	C 127			
Oven Temperature Se	t at 60C						
		<del>/</del>	,				
<u>Karen V</u> Technicia		Paul	MM4x aure		CET 117900 ification Type/No.		8/24/2011 Date
i ecimiciai	or a talling	argne	anni e	CEN	улганон Түрг/кө,		Dute

William Harrison

Certification Type/No.

Technical Responsibility

Staff Professional Position

### Form No. TR-D698-2

Revision No. : 0

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance

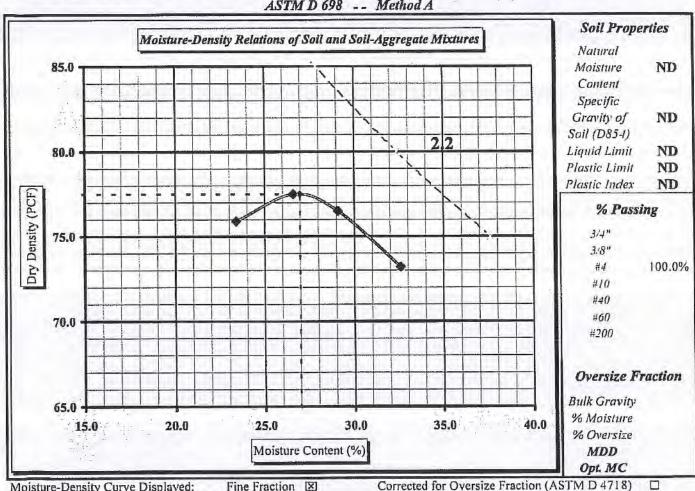
### S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

S&ME Project #:	1356-11-016	Pha	se 1	Report Date:	9/26/11
Project Name:	Marshall Steam Sta	tion - Landfill Test	ing Services	Test Date(s):	9/19-26/11
Client Name:	Duke Energy			Amend	led Report
Client Address:	Charlotte, NC				
Boring #:	NA	Sample #:	S-2	Sample Date:	9/8/2011
Location:	Cell 2-F12	Offset:	NA	Depth:	NA
Sample Descripti	on: Fly Ash				

**Maximum Dry Density** 

77.5 PCF. Optimum Moisture Content 27.0%

ASTM D 698 -- Method A



Corrected for Oversize Fraction (ASTM D 4718) Moisture-Density Curve Displayed: Fine Fraction 🗵 3/8 inch Sieve 3/4 inch Sieve □ #4 Sieve X Sieve Size used to separate the Oversize Fraction: Dry Preparation 🗵 Manual Rammer Moist Preparation Mechanical Rammer References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

Oven Temperature Set at 60C.

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Uffort

William Harrison Technical Responsibility Signature

Project Engineer

1-18-17

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

### S&ME, Inc.~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

	Box MIE, Inc.	2. 7751 Southern	1 11.0 1501			,	
Project #:	1356-11-016		Phase		Report D		9/26/11
Project Name:	Marshall Steam St	ation - Landfill Te	sting Ser	vices	Test Da		/19-26/11
Client Name:	Duke Energy					Amended F	leport
Client Address:	Charlotte, NC						
Boring #:	NA	Sample	#:	S-2	Sample D		9/8/2011
Location:	Cell 2-F12	Offse	t:	NA	De	epth:	NA
Sample Descript							
Type and Specifica	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			and Specificat		ME ID#	Cal Date:
Balance (0,1 g)			·	paction Mold		20231	12/29/2010
Balance	22182	i		paction Hamme		20222	6/6/2011
Straightedge				n		10844	7/2/2011
Sieve	3599	1555		1 David	:1:4.3	Check:	
Water Content		ntent requires GP 2 I		ASTM D4959		•	D4643 🗆
ASTM D221	o water Added:			ASTM D4939		VOLIM	<u> </u>
	water Added. Tare #:		JLG	PTL	JRC	G	
A. Tare Weight	A.		163.0	168.3	156.6	157.5	
B. Wet Wt + Tar			799.2	775.0	756.7	771.9	
			678.5	647.5	621.5	620.9	
C. Dry Wt. + Tai						151.0	
D. Water Weight			120.7	127.5	135.2		
E. Dry Weight	C-A		515.5	479.2	464.9	463.4	
F. Moisture Co	1 (St.) 1777		23.4%	26.6%	29.1%	32.6%	
Compaction Da		a GP 5 Balance for A		- 15 To A 15 A 1	24.7	- C-1777-1771-1771-1781	1000/1000
ASTM D558 □	- 1 TA - 1819 1 TEV	- ph/\$6	D1557 □	AASHTO Mathad D (A	) T99 □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	1.5	HTO T180 E
Method A ⊠		☐ Method C	்□ 5661	5728	5738	5714	O Memod B E
G. Wt of Soil + 1			4253	4253	4253	4253	_
H. Wt. of Mold	H.			<b>-</b>	<u> </u>	1461	
1. Wt. of Soil (g.			1408	1475	1485		
	os.) I/453.6 or l		3.104	3.252	3.274	3.221	
K. Mold Volume			30.16	30.16	30.16	30.16	
L. Wet Density (			93.6	98.1	98.7	97.1	
M. Dry Density			75.9	77.5	76.5	73.2	
1 C C C C C C C C C C C C C C C C C C C	eparate the Oversize Frac		#4 Sieve		3/8 inch Sieve		3/4 inch Sieve □ paration □
Mechanical Ram		Rammer   AASTM D 4318, D 8	254 13 2497	Moist Prep	aration	Dry Pre	paramon iz
References / Comm		AA51WLD 4516, D 6	34. D 2407	. C 127			
Oven Temperature S	oci at ooc.	)					
		$\overline{}$	<del></del>				
Kare	n Warner	Can War	uer	N	ICET 117900		9/26/2011
***************************************	ician Name	Signature		Cer	tification Type/No.		Date
******	** *	Yawylw Signature William Hose	in the	(for)	signt Engineer		1/21/12
William	m Harrison	contian May	wer	Pro	oject Engineer		1167116

Position

Technical Responsibility

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Signature

Date

### Form No. TR-D698-2

Revision No. : 0

Revision Date: 11/21/07

### Moisture - Density Report



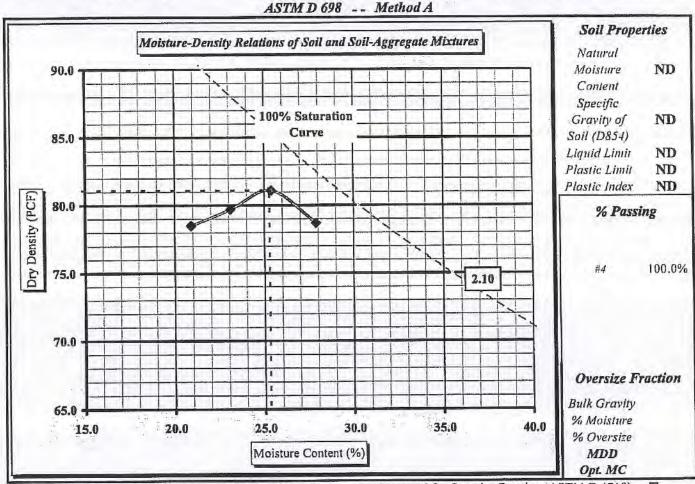
Quality Assurance

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COLUMN T. DEC.	C 47 TO	T) l I	Charlotte, NC 28273
PATIVIN ING ~ U.S.	Southern Pr	ne Kanbevaru ~	a marriagle, iva. ZAZ/3
DOCTATION THE	Pontener m v	THE TRANSFEL STATE	CHRISTOSON TIC BORIS

1356-11-016 Ph. 1			Report Date:	10/26-31/11	
Marshall Steam Sta	ition - Landfill Testin	ng Services	Test Date(s):	10/31/11	
Duke Energy	Tutt				
Charlotte, NC				(Introd)	
NI	Sample #:	3	Sample Date:	10/20/2011	
Cell 2 - A110	Offset:	N1	Depth:	NI	
	Marshall Steam Sta Duke Energy Charlotte, NC	Marshall Steam Station - Landfill Testi Duke Energy Charlotte, NC NI Sample #:	Marshall Steam Station - Landfill Testing Services  Duke Energy Charlotte, NC  NI Sample #: 3	Marshall Steam Station - Landfill Testing Services Test Date(s):  Duke Energy Charlotte, NC NI Sample #: 3 Sample Date:	

Sample Description: Fly Ash

Maximum Dry Density 81.1 PCF. **Optimum Moisture Content** 25.3%



Corrected for Oversize Fraction (ASTM D 4718) Fine Fraction 🗵 Moisture-Density Curve Displayed: #4 Sieve X 3/8 inch Sieve 3/4 inch Sieve Sieve Size used to separate the Oversize Fraction: Dry Preparation 🗵 Moist Preparation Mechanical Rammer Manual Rammer \*ND = Not determined \*NI = Information was not provided References / Comments / Deviations:

ASIM D 2216; Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698; Laboratory Compaction Characteristics of Soil Using Standard Liffort

VARM William Harrison Technical Responsibility

1-18-12 Date

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180 

Quality Assurance

	-11-016 Ph. 1		11 m	•	Report I		/26-31/11
<u> </u>		ation - Landfi	III Testing Se	rvices	Test Da	te(s)	0/31/11
	Energy otte, NC						
	one, NC		1 11		~		100100-
Boring #: N1			mple#:	3	Sample D		0/20/2011
	2 - A110		Offset:	NI	De	pth:	N1
Sample Description:	Fly Ash	N 11 10 10 10 10 10 10	n , site siden	100 - 0.00	Harrier I Boo	Len Vestino, Sc	
Type and Specification Balance (0.1 g)	<i>S&amp;ME II</i> 22182	DOMESTICAL CONTRACT		<i>e and Specificoti</i> npaction Mold	무슨 일단 네	ME ID #	Cal Date:
Balance (0.1 g)	22182	production and the second of the second		npaction Mold		20231 20222	12/29/2010 6/6/2011
Straightedge	20124		/2011 Ove			22151	10/4/2011
Sieve #4	10939	- Carana San	24 Carlotte	en for de particular de la companya de la companya De la companya de la			10/1/2011
Water Content	Water Cor	itent requires C	GP 2 Balance (	0.1 gram Readab	lity).	Check:	
ASTM D2216 区	化硫酸 有知识 化二二烷 化二烷基磺酸酯	ТО Т265 □		ASTM D4959	the control of the state of the con-	The Art State of the Art State of	04643 □
W	ater Added:	300	250	200	150	350	Natural
	Tare #:	G	18	699	DLB	PTL	
A. Tare Weight	A.	157.8	158.6	155.0	160.3	169.2	
B. Wet Wt + Tare Wt	В.	944.3	985.8	1071.8	989.5	1685.0	
C. Dry Wt. + Tare Wt.	C.	772.5	818.5	899.8	846.1	1331.5	
D. Water Weight	B-C	171.8	167.3	172.0	143.4	353.5	
E. Dry Weight	C-A	614.7	659.9	744.8	685.8	1162.3	
F. Moisture Content	100*D/E	27.9%	25.4%	23.1%	20.9%	30.4%	
Compaction Data	Requires a			gram or .0022 Lb		Check:	
ASTM D558 □	ASTM D 698	Alberta Ari	TM D1557	AASHTO	• •		TO T180
Method A 区	Method B	174 February 1	regular for the artists of the con-	Method D (AS	•		O Method D
G. Wt of Soil + Mold	G.	5766	5782	5727	5679	5778	
H. Wt. of Mold	H.	4252	4252	4252	4252	4252	
1. Wt. of Soil (g. or lbs.)	G-H	1514	1530	1475	1427	1526	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.338	3.373	3.252	3.146	3.364	
K. Mold Volume Factor	K.	30.16	30.16	30.16	30.16	30.16	-
L. Wet Density (PCF)	J*K	100.7	101.7	98.1	94.9	101.5	
M. Dry Deasity (PCF)	L/(1+F)	78.7	81.1	79.7	78.5	77.8	
Sieve Size used to separate the			#4 Sieve		3/8 inch Sieve		4 inch Sieve E
Mechanical Rammer	▼ Manual F	Rammer 🗆		Moist Prepa		Dry Prepa	
References / Comments / Dev	viations:	ND = Not deter	mined *NI = In	formation was not	provided		
		^					
		Jennedi MEan 9	10.				
<u>Jennifer Olse</u>					CET/117926		<u>10/31/2011</u>

S&ME, Inc. - Corporate

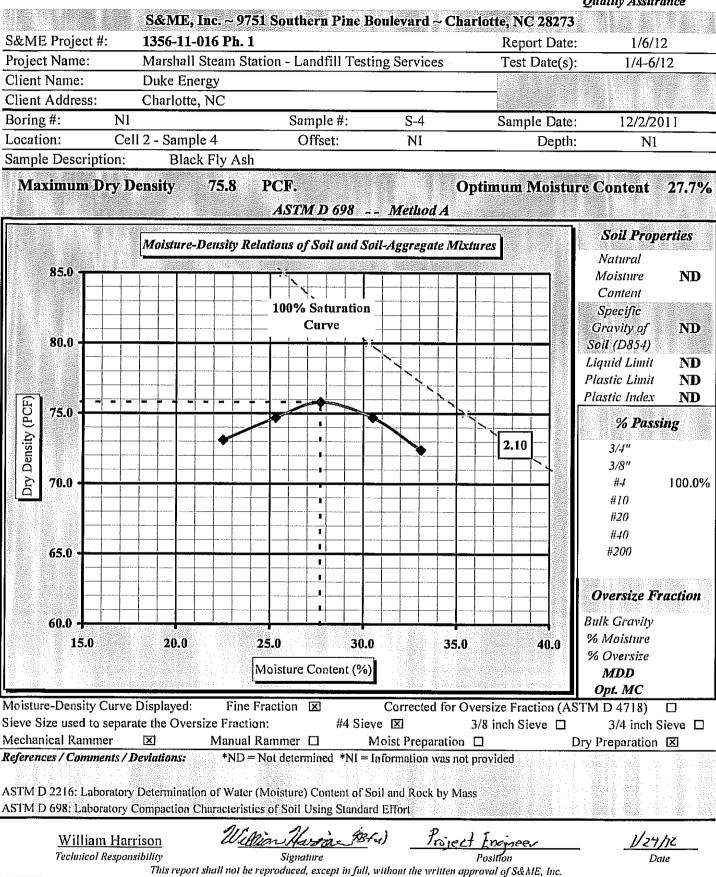
William Harrison Technical Responsibility

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance



Revision Na. 0

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558 D698 D1557 AASHTO T99 T180

Quality Assurance

Project #: 1356-11-01 Project Name: Marshall St Client Name: Duke Energ Client Address: Charlotte, N Boring #: NI	6 Ph. 1 team Stat	9751 South	iern Pine Boi	ulevard ~ Cha	rlotte. NC 28	772	
Project Name: Marshall St Client Name: Duke Energ Client Address: Charlotte, N	team Stat						
Client Name: Duke Energy Client Address: Charlotte, N					Report D		1/6/12
Client Address: Charlotte, N	71.7	ion - Landfi	III Testing Ser	vices	Test Da	te(s)	1/4-6/12
Boring #: NI	NC		• 11				
T 4 0 11 0 0			mple #:	S-4	Sample D		12/2/2011
Location: Cell 2 - San			Offset:	N1	De	pth:	N1
<del></del>	ack Fly A &MEID I		л			ME ID #	Cal Date:
Balance (0.1 g)	بر برا عامین 22182	6/8/		e <i>and Specificati</i> ipaction Mold		и <i>в ID #</i> 20231	12/29/2010
Balance (6:1 g)	22182	1 September 2 Community of American	Total Control Control Total Control Total	ipaction Mord ipaction Hamme	And the second s	10222 20222	6/6/2011
Straightedge	20124	Contraction (Separate Contraction)	/2011 Ove		Carried and the second and the secon	2151	10/4/2011
Sieve #4	10939	m, stokmyel / mktokwyere-lakeseat ,	<i>/</i> 2011		employees employees in the control of the control o		
Water Content W	ater Conte	nt requires C	P 2 Balance (0	.1 gram Readab	ility).	Check:	
ASTM D2216 🗵		O T265 □		ASTM D4959		ASTM	D4643 🗆
Water A	\dded:	§200	250	300	350	400	Redo 200
	fare #:	51	KO	EL	698	699	KBM
A. Tare Weight	A:	162.2	164.8	164.7	153.8	155.1	153.9
B. Wet Wt + Tare Wt	В,	732.9	923.4	993.9	882.8	885.0	953.0
C. Dry Wt. + Tare Wt.	C.	627.6	770.0	813.9	712.6	703.4	806.3
D. Water Weight	B-C	105.3	153.4	180.0	170.2	181.6	146.7
E. Dry Weight	C-A	465.4	605.2	649.2	558.8	548.3	652.4
paylous last me	0*D/E	22.6%	25.3%	27.7%	30.5%	33.1%	22.5%
ASTM D558 □ ASTM  Method A ⊠ M	1 D 698 🗷 ethod B 🛚	1 AS Method	TM DI557 🔲	gram or .0022 Lb AASHTO Method D (AS	T99 □ TM 1978) □	AASH	HTO T180 E
G. Wt of Soil + Mold	G,	5621	5660	5707	5719	5702	5600
H. Wt. of Mold	Н.	4252	4252	4252	4252	4252	4252
l. Wt. of Soil (g. or lbs.)	G-H	1369	1408	1455	1467	1450	1348
J. Wt of Soil (Lbs.) 1/453.	6 or I	3.018	3.104	3.208	3.234	3.197	2.972
K. Mold Volume Factor	K.	30.16	30.16	30.16	30.16	30.16	30.16
L. Wet Density (PCF)	J*K	91.0	93.6	96.8	97.5	96.4	89.6
M. Dry Density (PCF)	/(1+F)	74.2	74.7	75.8	74.7	72.4	73.1

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### Form No. TR-D698-2

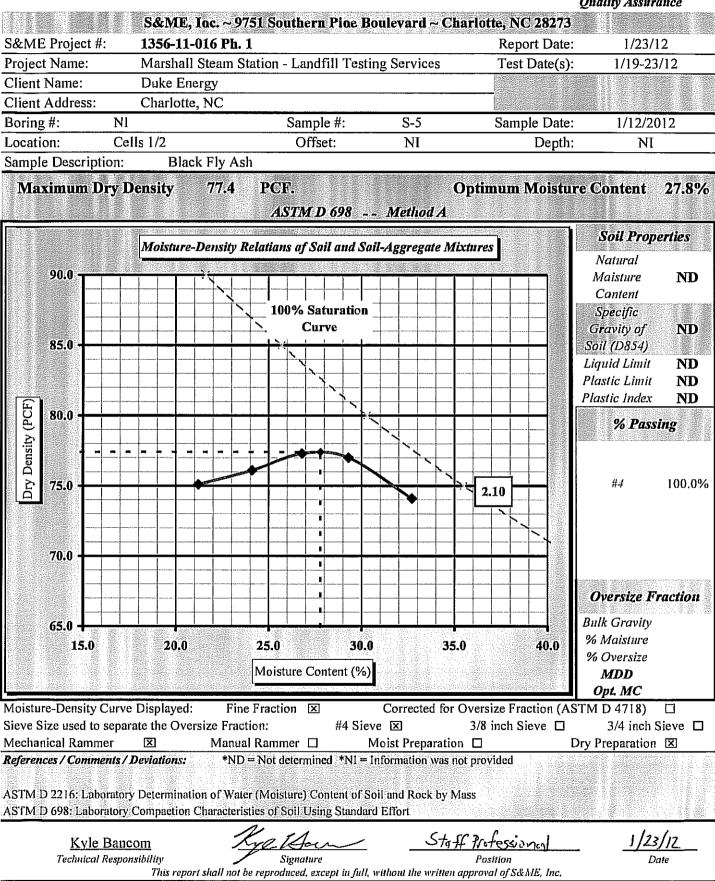
Revisian No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance



Revision No. 0

Revision Dote: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project Name: Marshall Steam Station - Landfill Testing Services Test Date(s) 1/19-23/ Client Name: Duke Energy Client Address: Charlotte, NC  Boring #: NI Sample #: S-5 Sample Date: 1/12/20 Location: Cells 1/2 Offset: NI Depth: NI Sample Description: Black Fly Ash  Type and Specification S&ME ID # Cal Date: Type and Specification S&ME ID # Cal Date Balance (0.1 g) 22182 6/8/2011 Compaction Mold 20231 1/6/2				ie <b>rn Pin</b> e Bo	ulevard ~ Cha		S/ABORE ME SANCTON AND SECTION SECTIONS	
Client Name:   Duke Energy   Client Address:   Charlotte, NC						•		1/23/12
Client Address: Charlotte, NC		Marshall Steam St	ation - Landfi	Il Testing Se	rvices	Test Da	te(s) 1/	19-23/12
Boring #: NI								
Location:   Cells 1/2   Offset:   NI   Depth:   NI   Sample Description:   Black Fly Ash	Client Address:	Charlotte, NC						
Sample Description:   Black Fly Ash   Type and Specification   S&ME ID #   Cal Date: Type and Specification   S&Mechanical Rammer   Date: Type and Specification   S&ME ID *   Cal Date: Type an				<del></del>	S-5			/12/2012
Type and Specification				Offset:	NI	De	pth:	Nl
Balance (0.1 g)   22182   6/8/2011   Compaction Mold   20231   1/6/2								
Balance   22182   6/8/2011   Compaction Hammer   20222   6/6/2								Cal Date:
Straightedge   20124   1/17/2012   Oven   22151   10/4/2015		A	SHIPT THINK AND AND AND AND THANK	and the property of the second	The state of the s	compression to each a line, many on the place of the entire specified at the	SALES CONTRACTOR COMMENCE CONTRACTOR	1/6/2012
Sieve #4   10939   10/4/2011     Water Content   Water Content requires GP 2 Balance (0.1 gram Readability).   Check:   ASTM D2216	when any combination of a consideration of the batter	Control of the Contro	2000-000-000-000-000-000-000-000-000-00	elithermus defets a colonium to a recent	Salas and the first of the salas and the sal		Section of the Sectio	6/6/2011
Water Content         Water Content requires GP 2 Balance (0:1 gram Readability).         Check:           ASTM D2216 図         AASHTO T265 □         ASTM D4959 □         ASTM D4643           Water Added:         150         100         50         As Is         200           Tare #:         KBM         51         DMJ         GH         SR           A. Tare Weight         A.         154.1         162.6         164.5         163.5         163.1           B. Wet Wt + Tare Wt         B.         890.5         1031.9         964.9         1011.5         980.9           C. Dry Wt. + Tare Wt         C.         723.7         848.1         809.6         863.3         779.4           D. Water Weight         B-C         166.8         183.8         155.3         148.2         201.5           E. Dry Weight         C-A         569.6         685.5         645.1         699.8         616.3           F. Moisture Content         100*D/E         29.3%         26.8%         24.1%         21.2%         32.7%           Compaction Data         Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).         Check:           ASTM D558 □         ASTM D 698 図         ASTM D1557 □         AASHT	The state of the s	www.com.com.com.com.com.com.com.com.com.com	Say Series (About 1997 Series Ser	AND THE PROPERTY OF THE PROPER			221315	10/4/2011
ASTM D2216 図 AASHTO T265 □ ASTM D4959 □ ASTM D4643    Water Added   150	AME AND COMPANY OF THE PROPERTY OF THE PARTY	AND THE PROPERTY OF THE PROPER	Complete 13 Section 20 ( 27 pers 100) ( 100) ( 100) ( 100) ( 100) ( 100)	year your and the property of the second sec	N I gram Pandah	ilibi)	Charle	
Water Added:   150				ir z balance (i				D4643 [T
Tare #: KBM   51   DMJ   GH   SR	The second secon	rivame citylefammicifmsfamber, certy, coshtyry ammon ammitted	AND THE RESERVE THE PROPERTY OF THE PARTY OF	100	Marting the form of the behavior of the related by the party of the pa	(XXXX-1-mell-m)-m/1 - 1-11-1-2-2-4/1-1-12-3-14-2-3-14-14-1-1-1-1	20/0 21/4m to Bartill and IIII 40/67/44 11/7/2/2/11/4/2/III	
A. Tare Weight  A. 154.1 162.6 164.5 163.5 163.1  B. Wet Wt + Tare Wt  B. 890.5 1031.9 964.9 1011.5 980.9  C. Dry Wt. + Tare Wt.  C. 723.7 848.1 809.6 863.3 779.4  D. Water Weight  B-C 166.8 183.8 155.3 148.2 201.5  E. Dry Weight  C-A 569.6 685.5 645.1 699.8 616.3  F. Moisture Content  100*D/E 29.3% 26.8% 24.1% 21.2% 32.7%  Compaction Data  Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability). Check:  ASTM D558 □ ASTM D 698 ☒ ASTM D1557 □ AASHTO T99 □ AASHTO T18  Method A ☒ Method B □ Method C □ Method D (ASTM 1978) □ AASHTO Method G. Wt of Soil + Mold  G. Wt of Soil + Mold  H. 4252 4252 4252 4252 4252 4252  I. Wt. of Mold  H. 4252 4252 4252 4252 4252 4252  I. Wt. of Soil (g. or lbs.) G-H 1501 1478 1425 1372 1482  J. Wt of Soil (Lbs.) 1/453.6 or 1 3.309 3.258 3.142 3.025 3.267  K. Mold Volume Factor  K. 30.09 30.09 30.09 30.09 30.09  L. Wet Density (PCF) J*K 99.6 98.0 94.5 91.0 98.3  M. Dry Density (PCF) L/(1+F) 77.0 77.3 76.1 75.1 74.1  Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve □ 3/4 inch Sieve □ Dry Preparation			CONTRACTOR CONTRACTOR		The state of the s	225-455-4550 (*** E005-69002000)	moles accordance de car	
B. Wet Wt + Tare Wt C. 723.7 848.1 809.6 863.3 779.4  D. Water Weight B. C-A 569.6 685.5 645.1 699.8 616.3  F. Moisture Content Compaction Data Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).  ASTM D558 □ ASTM D698 ■ ASTM D1557 □ AASHTO T99 □ AASHTO T18  Method A ■ Method B □ Method C □ Method D (ASTM 1978) □ AASHTO Method D (ASTM 1978) □ AASH	A Tare Weight	Violentiamentamentamentamentamentamentamentament	SAREST WAS TO PACKET I LEGISLANDS OF CHARACTER	· Applement and property of the second secon	No. of Control of the	Sub-Charles Not Laborate Control of the	YARE DANDER BRAND ON COLOR VILLA (CARREL	
C. Dry Wt. + Tare Wt.         C.         723.7         848.1         809.6         863.3         779.4           D. Water Weight         B-C         166.8         183.8         155.3         148.2         201.5           E. Dry Weight         C-A         569.6         685.5         645.1         699.8         616.3           F. Moisture Content         100*D/E         29.3%         26.8%         24.1%         21.2%         32.7%           Compaction Data         Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).         Check:         ASTM D558 □         ASTM D 698 ☒         ASTM D1557 □         AASHTO T99 □         AASHTO T18           Method A ☒         Method B □         Method C □         Method D (ASTM 1978) □         AASHTO Method D (ASTM 1978) □         ASTM D 18	<u>-</u>	100000000000000000000000000000000000000			<del>-</del>			
D. Water Weight B-C 166.8 183.8 155.3 148.2 201.5  E. Dry Weight C-A 569.6 685.5 645.1 699.8 616.3  F. Moisture Content 100*D/E 29.3% 26.8% 24.1% 21.2% 32.7%  Compaction Data Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability). Check:  ASTM D558 □ ASTM D 698 ⊠ ASTM D1557 □ AASHTO T99 □ AASHTO T18  Method A ⊠ Method B □ Method C □ Method D (ASTM 1978) □ AASHTO Method D (ASTM 197					<b>-</b>			
E. Dry Weight  C-A  569.6  685.5  645.1  699.8  616.3  F. Moisture Content  100*D/E  29.3%  26.8%  24.1%  21.2%  32.7%  Compaction Data  Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).  ASTM D558 □  ASTM D698 ■  ASTM D1557 □  Method A ■  Method B □  Method C □  Method D (ASTM 1978) □  AASHTO Method G  G. Wt of Soil + Mold  H. 4252  4252  4252  4252  4252  4252  4252  4252  1. Wt. of Soil (g. or lbs.)  G-H  1501  1478  1425  1372  1482  J. Wt of Soil (Lbs.)  1/453.6 or 1  3.309  3.258  3.142  3.025  3.267  K. Mold Volume Factor  K. 30.09  30.09  30.09  30.09  30.09  30.09  30.09  30.09  M. Dry Density (PCF)  L/(1+F)  77.0  77.3  76.1  74.1  Sieve Size used to separate the Oversize Fraction:  Mechanical Rammer ■  Manual Rammer □  Moist Preparation  Dry Preparation		A CONTRACTOR AND A CONT			<b>-</b>			+
F. Moisture Content         100*D/E         29.3%         26.8%         24.1%         21.2%         32.7%           Compaction Data         Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).         Check:           ASTM D558 □         ASTM D 698 ☒         ASTM D1557 □         AASHTO T99 □         AASHTO T18           Method A ☒         Method B □         Method C □         Method D (ASTM 1978) □         AASHTO Method           G. Wt of Soil + Mold         G.         5753         5730         5677         5624         5734           H. Wt. of Mold         H.         4252         4252         4252         4252         4252           I. Wt. of Soil (g. or lbs.)         G-H         1501         1478         1425         1372         1482           J. Wt of Soil (Lbs.)         1/453.6 or l         3.309         3.258         3.142         3.025         3.267           K. Mold Volume Factor         K.         30.09         30.09         30.09         30.09         30.09           L. Wet Density (PCF)         J*K         99.6         98.0         94.5         91.0         98.3           M. Dry Density (PCF)         L/(1+F)         77.0         77.3         76.1         75.1         74.1		English and the second						
Compaction Data         Requires a GP 5 Balance for ASTM (1 gram or .0022 Lb. readability).         Check:           ASTM D558 □         ASTM D 698 □         ASTM D 1557 □         AASHTO T99 □         AASHTO T18           Method A □         Method C □         Method D (ASTM 1978) □         AASHTO Method           G. Wt of Soil + Mold □         G. 5753 5730 5677 5624 5734 5734         5677 5624 5734 5734 5734 5734 5734 5734 5734 573		# DECEMBER 1997 1997 1997 1997 1997 1997 1997 199			<del> </del>			1
ASTM D558 □ ASTM D 698 ▼ ASTM D1557 □ AASHTO T99       □ AASHTO T18         Method A ▼ Method B □ Method C □ Method D (ASTM 1978) □ AASHTO Method G. Wt of Soil + Mold       G. 5753       5730       5677       5624       5734         H. Wt. of Mold       H. 4252       4252       4252       4252       4252       4252         I. Wt. of Soil (g. or lbs.)       G-H       1501       1478       1425       1372       1482         J. Wt of Soil (Lbs.)       1/453.6 or 1       3.309       3.258       3.142       3.025       3.267         K. Mold Volume Factor       K. 30.09       30.09       30.09       30.09       30.09       30.09         L. Wet Density (PCF)       J*K       99.6       98.0       94.5       91.0       98.3         M. Dry Density (PCF)       L/(1+F)       77.0       77.3       76.1       75.1       74.1         Sieve Size used to separate the Oversize Fraction:       #4 Sieve       Moist Preparation       Dry Preparation	and the second s	25/22/F-V				the state of the s	Carried Commission Control of the Co	
Method A ☒         Method B ☐         Method C ☐         Method D (ASTM 1978) ☐         AASHTO Method D (ASTM 1978) ☐           G. Wt of Soil + Mold         G. 5753         5730         5677         5624         5734           H. Wt. of Mold         H. 4252         4252         4252         4252         4252           I. Wt. of Soil (g. or lbs.)         G-H         1501         1478         1425         1372         1482           J. Wt of Soil (Lbs.)         I/453.6 or L         3.309         3.258         3.142         3.025         3.267           K. Mold Volume Factor         K.         30.09         30.09         30.09         30.09         30.09           L. Wet Density (PCF)         J*K         99.6         98.0         94.5         91.0         98.3           M. Dry Density (PCF)         L/(1+F)         77.0         77.3         76.1         75.1         74.1           Sieve Size used to separate the Oversize Fraction:         #4 Sieve ☒         3/8 inch Sieve ☐         3/4 inch Sieve ☐           Mechanical Rammer         ☒         Manual Rammer         ☐         Moist Preparation         ☐								ITO T180
G. Wt of Soil + Mold G. 5753 5730 5677 5624 5734 H. Wt. of Mold H. 4252 4252 4252 4252 4252 1. Wt. of Soil (g. or lbs.) G-H 1501 1478 1425 1372 1482 J. Wt of Soil (Lbs.) 1/453.6 or 1 3.309 3.258 3.142 3.025 3.267 K. Mold Volume Factor K. 30.09 30.09 30.09 30.09 30.09 L. Wet Density (PCF) J*K 99.6 98.0 94.5 91.0 98.3 M. Dry Density (PCF) L/(1+F) 77.0 77.3 76.1 75.1 74.1 Sieve Size used to separate the Oversize Fraction: #4 Sieve ⊠ 3/8 inch Sieve □ 3/4 inch Sieve Mechanical Rammer ☑ Manual Rammer □ Dry Preparation □ Dry Preparation			THE REPORT OF THE PARTY OF THE					
H. Wt. of Mold H. 4252 4252 4252 4252 4252 4252 1. Wt. of Soil (g. or lbs.) G-H 1501 1478 1425 1372 1482  J. Wt of Soil (Lbs.) 1/453.6 or I 3.309 3.258 3.142 3.025 3.267  K. Mold Volume Factor K. 30.09 30.09 30.09 30.09 30.09  L. Wet Density (PCF) J*K 99.6 98.0 94.5 91.0 98.3  M. Dry Density (PCF) L/(1+F) 77.0 77.3 76.1 75.1 74.1  Sieve Size used to separate the Oversize Fraction: #4 Sieve ☑ 3/8 inch Sieve ☐ 3/4 inch Sieve ☑ Moist Preparation ☐ Dry Preparation		The state of the s	. In the Committee of t					April 19 - 1
1. Wt. of Soil (g. or lbs.)       G-H       1501       1478       1425       1372       1482         J. Wt of Soil (Lbs.)       1/453.6 or 1       3.309       3.258       3.142       3.025       3.267         K. Mold Volume Factor       K.       30.09       30.09       30.09       30.09       30.09         L. Wet Density (PCF)       J*K       99.6       98.0       94.5       91.0       98.3         M. Dry Density (PCF)       L/(1+F)       77.0       77.3       76.1       75.1       74.1         Sieve Size used to separate the Oversize Fraction:       #4 Sieve ⊠       3/8 inch Sieve □       3/4 inch Sieve □         Mechanical Rammer       ☑       Manual Rammer       □       Dry Preparation		Children Constitution (Children Constitution		4252	+		4252	
J. Wt of Soil (Lbs.)       1/453.6 or I       3.309       3.258       3.142       3.025       3.267         K. Mold Volume Factor       K.       30.09       30.09       30.09       30.09       30.09         L. Wet Density (PCF)       J*K       99.6       98.0       94.5       91.0       98.3         M. Dry Density (PCF)       L/(1+F)       77.0       77.3       76.1       75.1       74.1         Sieve Size used to separate the Oversize Fraction:       #4 Sieve ⊠       3/8 inch Sieve □       3/4 inch Sieve □         Mechanical Rammer       ☑       Manual Rammer       □       Dry Preparation		ENDADA GUNDANA						
K. Mold Volume Factor       K.       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       30.09       98.0       94.5       91.0       98.3       98.0       94.5       91.0       98.3       74.1       75.1       74.1       74.1       74.1       76.1       75.1       74.1       74.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1       76.1		, , , , , , , , , , , , , , , , , , ,		ļ		<del> </del>		
L. Wet Density (PCF)       J*K       99.6       98.0       94.5       91.0       98.3         M. Dry Density (PCF)       L/(1+F)       77.0       77.3       76.1       75.1       74.1         Sieve Size used to separate the Oversize Fraction:       #4 Sieve ⊠       3/8 inch Sieve □       3/4 inch Sieve □         Mechanical Rammer       ☑       Manual Rammer       □       Dry Preparation		A not of control of the Management of						<del>                                     </del>
M. Dry Density (PCF)       L/(1+F)       77.0       77.3       76.1       75.1       74.1         Sieve Size used to separate the Oversize Fraction:       #4 Sieve ⊠       3/8 inch Sieve □       3/4 inch Sieve □         Mechanical Rammer       ☑       Manual Rammer       □       Moist Preparation       □       Dry Preparation		1 - 1 × 1 1/2 (4/2) (1/2) (1/2)			<del></del>	<del></del>		+
Sieve Size used to separate the Oversize Fraction: #4 Sieve 🗵 3/8 inch Sieve 🗆 3/4 inch S Mechanical Rammer 🗵 Manual Rammer 🗆 Moist Preparation 🗆 Dry Preparation		20 20 20 20 20 20 20 20 20 20 20 20 20 2			<del>-</del>			+
Mechanical Rammer IXI Manual Rammer 🗆 Moist Preparation 🗆 Dry Preparation	T .	500 (Pettern 11 to a 17 to a 1				1		  4 inch Sieve
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 15 1 125 N. 639 B. 159 P				3 1201 N 1997 1998	A 1000 St 1000 St 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		100,000		mined *NI = Ir			- <b></b>	anagana ya ani Tanta Santa
						·····		

Jennifer Olsen

Technician Name

Kyle Baucom
Technical Responsibility

fambi 10km

NICET/117926
Certification Type/No.

<u>1/23/2012</u> Date

Signature

TATE TOTESSIAN

1/23/12 Date

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### Form No. TR-D698-2

Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



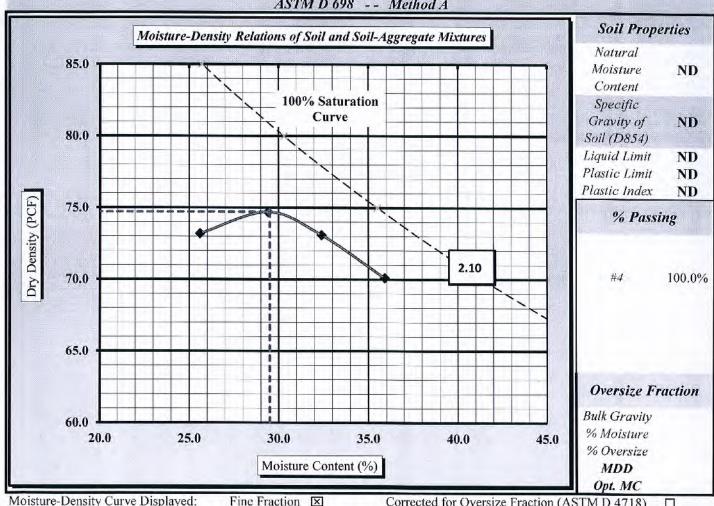
Quality Assurance

S&ME Project #		- 9751 Southern Pine Bo			4/22/12
				Report Date:	4/23/12
Project Name:	Marshall Ind.	Landfill No. 1 - Cells 1 &	2 Operations	Test Date(s):	4/16-23/12
Client Name:	Duke Energy				
Client Address:	526 South Chu	rch Street, Charlotte, NC	28202		
Boring #:	NI	Sample #:	6	Sample Date:	3/12/2012
Location:	Grid B14	Offset:	NI	Depth:	NI

**Maximum Dry Density** 

74.7 PCF. **Optimum Moisture Content** 29.5%

ASTM D 698 -- Method A



Moisture-Density Curve Displayed: Fine Fraction 🗵 Corrected for Oversize Fraction (ASTM D 4718) Sieve Size used to separate the Oversize Fraction: #4 Sieve 区 3/8 inch Sieve □ 3/4 inch Sieve □ Mechanical Rammer Manual Rammer □ Moist Preparation 🗵 Dry Preparation References / Comments / Deviations: \*ND = Not determined \*NI = Information was not provided

ASTM D 2216. Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

> Kyle Baucom Technical Responsibility

Signature

4/23/12

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Revision No. 0

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project #:	1356-11-01				Boulevard ~ Cha	Report I		4/23/12
Project Name:			fill No. 1 - Ce	lls 1 & 2	Operations	Test Da		1/16-23/12
Client Name:	Duke Energ		m (10. ) - CC	115 1 60 2	Operations	Test Du	to(s)	110-23/12
Client Address:			Street, Charlo	tte. NC 2	8202			
Boring #:	NI		-1	nple #:	6	Sample I	Date:	3/12/2012
Location:	Grid B14			ffset:	NI		epth:	NI
Sample Description		y Ash					Print	
Type and Specificat		&ME ID	# Cal D	ate:	Type and Specificati	ion S&	ME ID #	Cal Date:
Balance (0.1 g)		22182	6/8/2		Compaction Mold		20231	1/6/2012
Balance		22182	6/8/2	The second second	Compaction Hamme	er	20222	6/6/2011
Straightedge		20124	1/17/2	2012	Oven		22151	3/23/2012
Sieve #4		10939	10/4/2	2011		(i)		
Water Content	W	ater Con	tent requires G	P 2 Balanc	ce (0.1 gram Readab	ility).	Check:	1.0
ASTM D2216			ГО Т265 🗆		ASTM D4959			D4643 🗆
	Water A	Added:	300	250	200	150	300	
	1	Γare #:	5F	51	G	5C	KH	
A. Tare Weight		A.	158.2	163.5	158.5	157.1	158.8	
B. Wet Wt + Tare	e Wt	В.	969.9	1097.	2 1056.6	1028.6	1126.4	
C. Dry Wt. + Tar	e Wt.	C.	771.1	877.6	852.3	850.7	870.9	
D. Water Weight		В-С	198.8	219.6	204.3	177.9	255.5	1
E. Dry Weight		C-A	612.9	714.1	693.8	693.6	712.1	
F. Moisture Con	tent 10	00*D/E	32.4%	30.8%	6 29.4%	25.6%	35,9%	
Compaction Dat	a R	equires a	GP 5 Balance	for ASTM	(1 gram or .0022 L	b. readability).	Check:	
ASTM D558 □		M D 698	⊠ AST	M D1557	□ AASHTO	T99 🗆	AAS	SHTO T180
Method A ⊠	M	lethod B	☐ Method	СП	Method D (As	STM 1978) 🗆	AASH	TO Method D
G. Wt of Soil + N	1old	G.	5708	5725	5707	5634	5685	
H. Wt. of Mold		H.	4249	4249	4249	4249	4249	
I. Wt. of Soil (g.	or lbs.)	G-H	1459	1476	1458	1385	1436	A.
J. Wt of Soil (Lbs	s.) I/453	.6 or I	3.216	3.254	3.214	3.053	3.166	
K. Mold Volume		K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (F		J*K	96.8	97.9	96.7	91.9	95.3	
M. Dry Density		/(1+F)	73.1	74.8		73.2	70.1	
Sieve Size used to se Mechanical Ramr	parate the Over		ion:		Sieve 🗵 Moist Prepa	3/8 inch Sieve		3/4 inch Sieve □

Jennifer Olsen Technician Name

Technical Responsibility

Jeminety LOUSEN

NICET/117926
Certification Type/No.

4/23/2012 Date

Kyle Baucom

Signature

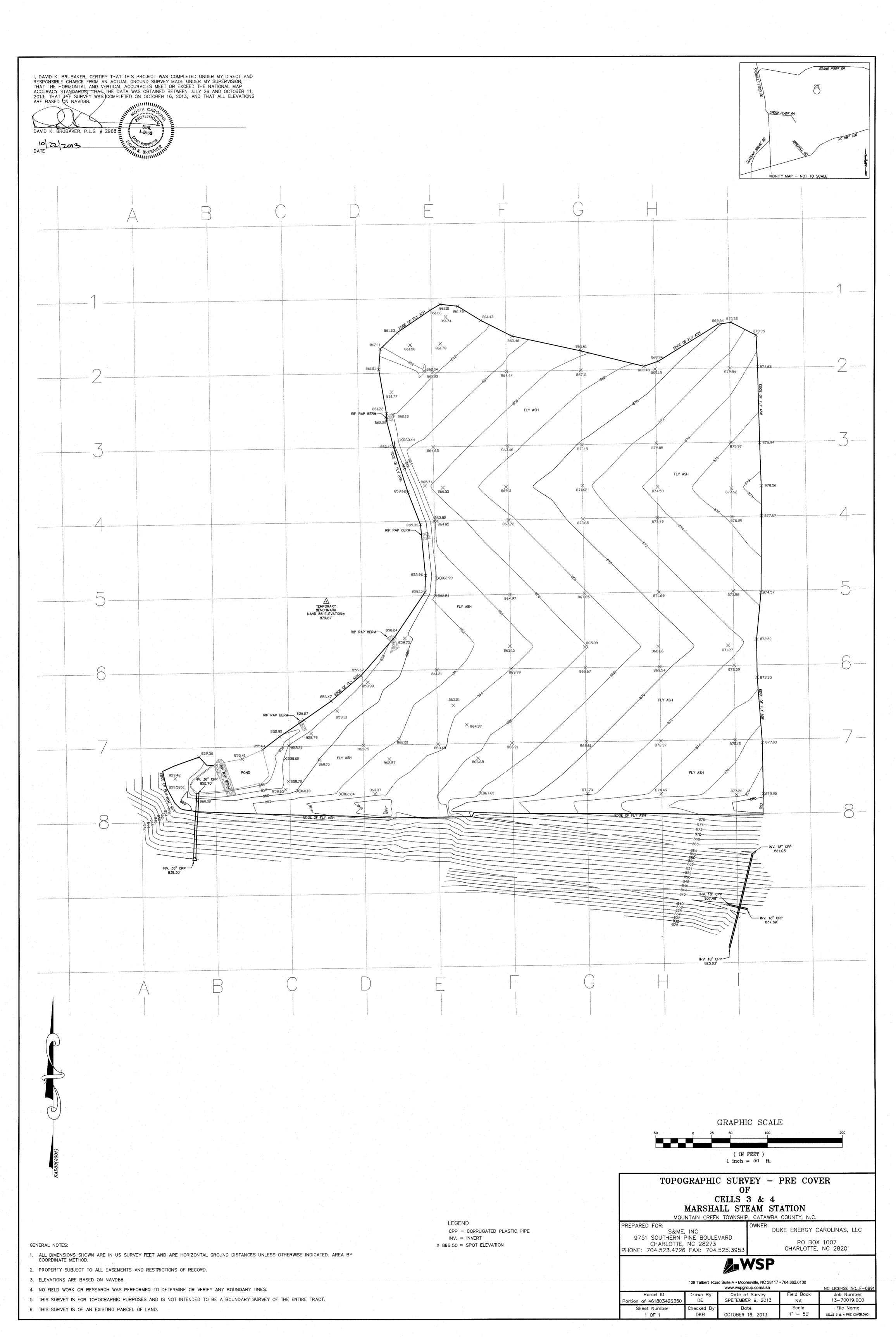
High Engineer

4/23/12 Date

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### Final Subgrade As-Built Drawing





## APPENDIX I – EARTHWORKS Section 2 – Structural Fill Soil Cover **Structural Fill Field Density Test Results Structural Fill Laboratory Test Results**

### **Structural Fill Field Density Test Results**





### **Summary of Density Test Results**

Page No.

Report Date: September 26, 2013

Project No.: 1356-11-032SF

Project Name: Marshall Ind.LF #1-Cells3-4Con

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

- 0	Test	In-Pl	ace Densi	ity Test	Check I	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
1	08/23/13	D 2937	91.1	26.6	93.2	22.1	698CP	TP-9	94.2	25.0	95	97	D2	
2	08/23/13	D 2937	92.0	26.3	93.2	22.1	698CP	TP-9	94,2	25.0	95	98	D2	
3	08/23/13	D 2937	97.2	23,4	94.9	22.5	698CP	CSL2	95.8	23.7	95	100+	DI	
4	08/23/13	D 2937	97.5	24.4	94.9	22.5	698CP	CSL2	95.8	23.7	95	100+	C2	
5	08/23/13	D 2937	95.1	26.2	94.9	22.5	698CP	CSL2	95.8	23,7	95	99	C2	
6	08/23/13	D 2937	93.5	23.5	93.2	22.1	698CP	TP-9	94.2	25.0	95	99	C1	
7	08/30/13	D 2937	94.9	22.9	95.1	20.1	698CP	CSL2	97.0	22.5	95	98	DI	
8	08/30/13	D 2937	90.4	23.9	93.3	22.0	698CP	TP-4	94.7	24.4	95	95	D2	
9	08/30/13	D 2937	93.1	21.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	D3	
10	08/30/13	D 2937	93.6	22.1	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	C1	
11	08/30/13	D 2937	93.5	20.7	95.1	20.1	698CP	CSL2	97.0	22.5	95	96	C3	
12	08/30/13	D 2937	98.0	20.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	100+	C2	
13	08/30/13	D 2937	95.0	22.2	95.1	20.1	698CP	CSL2	97.0	22.5	95	98	BI	
14	08/23/13	D 2937	94.5	22.3	95.1	20.1	698CP	CSL2	97.0	22.5	95	97	B2	
15	08/30/13	D 2937	91.8	21.0	95.1	20.1	698CP	CSL2	97.0	22.5	95	95	B3	
16	09/03/13	D 2937	92.6	26.2	92.2	22.6	698CP	TP-8	93.0	26.4	95	100	D3	
17	09/03/13	D 2937	90.6	26.5	92.2	22.6	698CP	TP-8	93.0	26.4	95	97	D2	
18	09/03/13	D 2937	93.5	26.5	92.2	22.6	698CP	TP-8	93.0	26.4	95	100+	D1	
19	09/03/13	D 2937	95,5	23.4	92.2	22.6	698CP	CSL2	95.8	23.7	95	100	C1	

<sup>\* =</sup> Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Tel Tomas Signature

Project Engineer

Position



### **Summary of Density Test Results**

Page No. 2

Report Date: September 26, 2013

Project No.: 1356-11-032SF

Project Name: Marshall Ind.LF #1-Cells3-4Con

Client: Duke Energy, Post Office Box 37929, 8320 Highway 150 East, Terrell, North Carolina 28682

	Test	In-Pl	ace Densi	ty Test	Check F	Plug Data	I	Referenc	e Standa	ard	Comp	action		
No.	Date	Туре	Dry Density	Moisture Content	Dry Density	Moisture Content	Туре	Ref. Curve	MDD	Optimum Moisture Content	Percent Specified	Percent In-Place	Location	Elevation or Stone Depth
20	09/03/13	D 2937	94.4	26.5	92.2	22.6	698CP	CSL2	95.8	23.7	95	99	C2	
21	09/03/13	D 2937	93.6	24.1	92.2	22.6	698CP	CSL2	95.8	23.7	95	98	C3	
					,									

\* = Failed Specified Compaction, \*\* = Failed Specified Moisture Content

All Test Locations and Elevations are Approximate

Notes:

References: ASTM D 2937: Density of Soil In Place by the Drive Cylinder Method, 698CP: MDD determined by check plug in accordance with S&ME procedure WI-TP-698-CP-REV2.

Distribution: Dean Snyder/Duke Energy

Kyle Baucom/S&ME, Inc.

Name (Technical Responsibility)

Signature

Project Engineer

Position

### **Structural Fill Laboratory Test Results**





# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Project Name:	ŀ	Marshall Industrial Landfill No.1 - Cells 3 & 4	ial Landfill	1 No.1 - C	ells 3 & 4								Rep	Report Date:	5/24/12
Client Name;		Duke Energy											Sam	Sample Date:	5/7/2012
Client Address:		526 South Church Street, Charlotte, NC 28202	ch Street,	Charlotte	, NC 282	02		-						Panel ID:	8
Boring #:	NA		Sample #:	TP-1	7			Depth:		-9-0			Pem	Perm Cell ID:	
Location:	Grid		Offset:				ple Descr	riptian: (	Orange 6	3rown Fin	e Sandy	Sample Description: Orange Brown Fine Sandy Slity Clay (MH)	MH)		
Liquid Limit:			Sp. Grav. (Assumed):	sumed):	2.,	2,700	Sar	Tple Typ	Sample Type: Remotded	olded			'n	Log #:	
Plastic Limit		38	Plast	Plastic Index:		24 Pe	Percent Passing #200;	sing #20		69.0%		Maximu	Maximum Particle Size:	Size:	#4
		Initial	Initial Sample Conditions	Conditic	รมเ							Final Sample Conditions	ole Cond	tlons	
Len	Length (cm):	7.	7.777	Wet De	Wet Density (PCF):	F);	186.2		Length (cm):	(сш):		7.777	- We	Wet Density (PCF):	115.5
Diam	Diameter (cm):	7.	7.267	Dry Der	Dry Density (PCF):	ii	61.3		Diameter (cm)	эг (стл):		7.27	- Day	Dry Density (PCF):	81.8
Are	Area (cm²)	4	41.48	Percent	Percent Saturation:	::	76.0		Area (cm²)	'ст <sup>2</sup> )		41.48	Per	Percent Saturation:	103.0
Volu	Volume (cm <sup>3</sup> )	35	322.58						Volume (cm <sup>3</sup> )	(cm <sup>2</sup> )		322.62		B-Parameter:	8.95
Wet we	Wet weight (grams)	ξ	549.1	νioV	Void Ratio:		1.059	\$	et weigh	Wet weight (grams)		596.9		Void Ratio:	1.059
Dry Wei	Dry Weight (grams)	4	423.6	l <sub>o</sub>	Porosity:		0.514	Ē	ry Weigh	Dry Weight (grams)		423.0	 	Porosity:	6.514
Percer	Percent Moisture:		29.8						Percent Moisture:	Aoisture:		41.1	<u> </u>	,	
Test Parameters:	neters:	Effect	fective Consolidation Strass (psl):	olidation S	tress (ps	i i	2.5	Perm	eant Lig	Permeant Liquid Used:	┞	Deaired Water	<u></u>	a <sub>ln</sub> (cm²)	6.631416
Hg Equi	Hg Equilibrium Level	+	1.990	Cell Pre	Ceil Pressure (psi):	: <u>:</u>	62.5	Ba	ack Press	Back Pressure (psi):	_	80.0		a <sub>out</sub> (cm²)	8.76712
Tim	Time (24-hr)	_	Temperature (°C)	ture (°C	.,		2	Weasurements	ments			1 1 1 1 1	î	K-Value	K-Value (cm/sec)
Start	End Time (sec)	Initial	Final	Ave.	Factor	Rp1	Ra1	Rp2	Ra2	Ħ	h2	Gradlent	Gradient	Uncorrected K-Value	Corrected K-Value
10:20	10;20 25	╁	23.6	23.6	0.9183	5.00	1.98	4.80	1.98	38.0	32.9	4.88	4.24	2.67E-06	2.45E-06
10:21	10:21 26	23.6	├		0.9183	5.00	1.98	4.60	1.98	38.0	32.9	4.88	4.24	2.57E-06	2.36E-06
╌	_	-	23.6	23.6	0.9183	5.00	1.98	4.50	1.98	38.0	31.7	4.88	4.07	2.75E-06	2.52E-06
10:32	10:32 26	┢╾	23.7	23.7	0.9162	5.00	1.98	4.68	1.98	38.0	32.9	4.88	4.24	2,57E-06	2.35E-06
	1														
-							$\dagger$	1							
					1										
Notes:	Регтоте	Permometer P700000 by Trautwein Soil Testing was used for permeation.	00 byTraut	wein Soil	Testing v	was usec	for perm	eation.		Ave	Averages:	4.88	4.20	2.64E-06	2.4E-06
								<u>_</u>				Conduct	Conductivity vs. Time		
References: ASTM D 508	<del>1.</del> ∑		of Hydraulic Conductivity of Saturated Porous	Sanductivi	ty of Satu	ırated Po	rous	ЭΠ	2.6E-06 2.5E-06						
STM D 2	Materials Using a Flexible Wall Permeameter ASTM D 2216: Laboratory Determination of Water (Moisture) Content	Materials Using a Flexible Wall Permeameter iboratory Determination of Water (Moisture) C	a Flexible nination of	Wall Per Water (M	meamete loisture) (	भ Content		K-Au	2,46-06	$\stackrel{\sim}{>}$					
	of Sai	of Soil and Rock by Mass	k by Mass					******	2.3E-06	].	200	4	400	, , , ,	
												Cun	Cumulalive Time (sec.)		
Technician:			Karen Warner	티			Signature				Stranger and Section 1990	A POLICE AND A STREET OF STREET OF STREET	enero despiratorios de despirado de la composição de la c	(II) the fact to the result of the top the contract (but to	- ATRACO (ANTONOMIA) ANTONOMIA
echnical l	Technical Responsibility;		Kyle Baucom					•	1	11/11/11/11	4	Pasitian:	ë	Project Engineer	<b>-</b> 1

Pasitian:

Signalum Life M

Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



Revision Date: 11/21/0	07	Manipagn c - Ten	oity ite post	***	,
		nnon mylan o Songgagogwas kokkonggan ya nggakon ora			Quality Assurance
	S&ME, Inc. ~97	51 Southern Pine B	oulevard $\sim$ Char	lotte, NC 28273	
S&ME Project #:	1356-11-032	Phas		Report Date:	5/17/12
Project Name:	Marshall Industria	ıl Landfill No. 1 - Cel	ls 3 & 4	Test Date(s):	5/15-17/12
Client Name:	Duke Energy				
Client Address:	526 South Church	Street, Charlotte, NO	28202		
Boring #: N		Sample #:	TP-1	Sample Date:	5/7/2012
Location: G	rid A3	Offset:	NI	Depth:	0-6'
Sample Description:	Orange Brow	n Fine Sandy Silty C	ay (MH)		
Maximum Dry	Density 88.0	PCF. <i>ASTM D 698</i> -		timum Moistu	re Content 28.5%
	Majetura Dancity Ra	tations of Soil and Soil	Angragata Miytur	as I	Soil Properties
Coll College C	Moisinte-Density Re	ianons oj son una son	-Aggregate McCini	C)	Natural
100.0					Moisture ND
					Content
		100% Saturation Curve	1		Specific
95.0		Curve			Gravity of ND
93.0					Soil (D854) Liquid Limit 62
<u></u> -					Plastic Limit 38
	+ + + + + + + + + + + + + + + + + + + +				Plastic Index 24
€ 90.0 <del> </del>					
90.0 Pory Density (PCF)					% Passing
yii					3/4" 96.5%
)em	االعلااا				3/8" 92.8%
85.0					#4 91.6%
					#10 90.0%
					#20 87.2% #40 87.9%
			-		#200 69.0%
80.0			İ	2.65	1/200 09:070
					Oversize Fraction
75.0					Bulk Gravity
20.0	25.0	30.0 35.	0 40.0	45.0	% Moisture
		The same of the same			% Oversize
		Moisture Content (%			MDD
Moisture-Density Curv	va Dienlavad: Fine	Fraction 🗵	Corrected for Ovi	ersize Fraction (AS	<i>Opt. MC</i> STM D 4718) □
_	arate the Oversize Fract			/8 inch Sieve □	3/4 inch Sieve □
Aechanical Rammer			Moist Preparation		Ory Pgeparation ⊠
References / Comments .		= Not determined *NI = 1			Jenneler LOesen
					· <i>U</i>
	1.T	r (Moisture) Content of S			
AD HALLY 096; Laboralor	y-compaction Characteris	tics of Soil Using Standar	u iziioru — ele Nada		
Kyle Baı	icom	Had Home	- Project A	TY/NO/	5/30/12
• •				<u>- プ ''</u>	- <u>,                                     </u>

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Signature

Position

Technical Responsibility

Ďate

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	S&ME, I	787 M 2550, nc. ~ 9751 Soutl	HIND TO TIE COOKER BRANCH CHECKER	a <i>A3H1O 199, 1</i> ulevard ~ Cha	to extraor control in the cade	esterni i tri respiniste	mty Assurance
Project #:	1356-11-032		Phase	03	Report I	Date:	5/17/12
Project Name:	Marshall Indus	rial Landfill No	. 1 - Cells 3 &	: 4	Test Da	ite(s)	5/15-17/12
Client Name:	Duke Energy						
Client Address:	526 South Chu	ch Street, Charl	otte, NC 2820	2			
Boring #:	NI	Sa	ımple #:	TP-1	Sample I	Date:	5/7/2012
Location:	Grid A3	(	Offset:	NI	D	epth:	0-6'
Sample Description	on: Orang	e Brown Fine Sa	andy Silty Cla	y (MH)			
Type and Specificat	tion S&M	EID# Cal.	Date: Typ	e and Specificat	ion S&	ME ID#	Cal Date:
Balance (0.1 g)		er erger service to		npaction Mold		20231	1/6/2012
Balance	V 1, 12-11 1, 12-11 1, 12-11			npaction Hamme		20222	6/6/2011
Straightedge			/2012 Ove	n		10844	5/9/2012
Sieve #4			2012				
Water Content ASTM D2216		Content requires ( SHTO T265 □	3P 2 Balance (0	l gram Readab. ASTM D4959		Check AS	ΓM D4643 □
	Water Adde	d: 180	240	120	300		
	Tare	#: 691	EL	JC	13		
A. Tare Weight	A.	156.5	165.8	164.1	156.8		
B. Wet Wt + Tare	Wt B.	1155.5	1134.4	1101.8	1083.2		
C. Dry Wt. + Tare	e Wt. C.	938.6	909.9	916.5	853.8		
D. Water Weight	B-C	216.9	224.5	185.3	229.4		
E. Dry Weight	C-A	782.1	744.1	752.4	697.0		
F. Moisture Con	tent 100*D	Æ 27.7%	30.2%	24.6%	32.9%		
Compaction Dat ASTM D558 口 Method A 区	ASTM D 6	B □ Method	TM D1557 🗆	AASHTO Method D (AS	T99 🗆 STM 1978) 🗆	A	: ASHTO T180 □ SHTO Method D □
G. Wt of Soil + M	Iold G.	5933	5962	5855	5961		
H. Wt. of Mold	Н.	4242	4242	4242	4242		
I. Wt. of Soil (g. o	or lbs.) G-H	1691	172 <b>0</b>	1613	1719		
J. Wt of Soil (Lbs	.) 1/453.6 or	3.728	3.792	3.556	3.790		
K. Mold Volume	Factor K.	30.09	30.09	30.09	30.09		
L. Wet Density (P	CF) J*K	112.2	114.1	107.0	114.0		
M. Dry Density (	PCF) L/(1+:	F) 87.9	87.6	85.9	85.8		
Sieve Size used to sep		raction:	#4 Sieve		3/8 inch Sieve		3/4 inch Sieve □
Mechanical Ramm		ıal Rammer 🔲		Moist Prepa		Dry	Preparation 🗵
References / Commen	nts / Deviations:	*ND = Not dete	rmined *NI = In	formation was not	t provided		
				· · · · · · · · · · · · · · · · · · ·			
	er Olsen ian Name	<u> </u>	JOBL Janure		CET/117926 ification Type/No.		<u>5/17/2012</u> Date
	Baucom esponsibility	<u>HLC</u> Sign	ature	<u> Frige</u>	Foginge/ Position		<u>5/30/12</u> Date

Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~9751 Southern Pine Boulevard ~ Charlotte, NC 28273 S&ME Project #: 1356-11-032 Phase 03 5/24/12 Report Date: Marshall Industrial Landfill No. I- Cells 3 & 4 Project Name: Test Date(s): 5/14/-24/12 Client Name: **Duke Energy** 526 South Church Street, Charlotte, NC Address: Boring #: NΑ Sample #: TP-1 Sample Date: 5/7/12 Location: Grid A3 Offset: NI Elevation: 0-61

Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Gravel: 8.4% Maximum Particle Size: 3/4" Silt 30.5% Silt & Clay (% Passing #200): Total Sand: 22.6% 38.5% 69.0% Clay int Relative Density (Assumed) 2.700 Moisture Content Colloids Liquid Limit 62 Plastic Limit 38 Plastic Index 24 1.6% Coarse Sand: Medium Sand: 2.1% Fine Sand: 18.9% Description of Sand and Grayel Rounded Angular Hard & Durable Soft Weathered & Friable □ Mechanical Stirring Apparatus A Dispersion Period: Dispersing Agent: Sodium Hexametaphosphate: 1 min. 40 g./ Liter References / Comments / Deviations: ASTM D 4318, D 2487 NI = Information not provided.

Kyle Baucom

Technical Responsibility

Technician Name:

Signature

Project Engineer

Position

7/36/J7\_ Date

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Date:

### Form Na. TR-D422-2

Revision No. 0

Revision Date: 02/20/08

1356-11-032 Phase 03

Project #:

Particle Size Analysis of Soils

ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Bonlevard ~ Charlotte, NC 28273 Report Date: 5/24/12

 $K \times ((L/T)^{1/2}$ 100.0% 69.0% 100.0% 100.0% %0.06 Diameter 0.03083 0.00841 0.00126 96.5% 94.3% 92.8% 87.9% 85.9% 81.1% 0.04199 0.01964 0.01167 0.00599 0.00294 87.2% 91.6% Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar 100.0% 0.01290 0.01282 0.01297 %6.96 97.7% 95.4% 90.1% 76.7% (washed) Table 3 0.01297 0.01297 0.01290 0.01290 0.01290 Pan # Weathered & Friable × Cal. Date: Retained Wt. 152H Effective Depth 19.5 24.9 29.0 34.4 10.8 10.5 5.1 12.8 12.9 <u>...</u> 5 13.2 4.6 13.7 0.0 12.1 겅 Px% Passing #10 Sieve #100 #200 3.0" 1.5.1 1.0.1 3/4" 3/8" #10 #20 #40 09# 1/2" #4 P(total) =58.5% 68.1% 56.6% 47.0% 41.2% 39.3% 36.4% 30.7% 3901 Soft 151H Percent Passing 2.700 Natural 526 South Church Street, Charlotte, NC 2 5/7/12 0-6 1 min. (Rxa/W)x100 ID No. Apparent Relative Density (Assumed) Hygroscopic P(#10) =65.0% 75.7% 62.9% 52.2% 45.8% 43.7% 34.1% 40.5% 7.65% 25.49 Type: 16.08 26.21 0.72 及 9.41 Hard & Durable Dispersion Time: Hydrometer: 5/14/-24/12 Sample Date: Elevation: Hydrometer % Moisture (100 x D/E) Water Wt. (B-C) (C-A) 35.50 30.50 21.50 20.50 16.00 29.50 24.50 19.00 Moisture Content Wet Wt. + A Dry Wt. + A Test Date(s): Tare Wt. Tare# Dry Wt. Composite Correction 6/23/2011 Angular Address: Corrections П A Sample Description: Orange Brown Fine Sandy Silty Clay (MH) Д М C Marshall Industrial Landfill No. 1- Cells 3 & 4 ASTM D 422, D 2487, D 4318  $\Xi$ Cylinder Control Cal. Date: 4.0 5.5 5.5 5.0 343.19 Composite Correction 5.5 5.0 366.82 %0.06 366.82 50.00 46.45 66.0 Sample #: Offset: Rounded Hydrometer Reading 41.0 36.0 35.0 30.0 26.5 25.5 23.0 Beaker #: Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 3222  $\boxtimes$ Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Devintions Temp. (0.5 °C) NI = Information not provided. 23.0 23.0 23.0 23.5 23.5 23.5 24.0 23.5 Correction Factor a (Table 1): × Stirring Apparatus: A Grid A3 ID No. Fotal Sample Oven Dried: Pan Tare Weight (grams): Courtrol Cylinder Hydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 5 30 9 Boring #: C) 'n .ocation:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900

Karen Warner

Technician Name

Certification #

5/30/12

Project Engineer

1356-11-032 Phase 03 TP-1 (0-6") Hydro.xls

Page 1 of 1

Revision No. 0

Revision Date: 11/20/07

### Liquid Limit, Plastic Limit, and Plastic Index

Another code ASTM D 4318 X AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Project #: 1356-11-032 Phase 03 Report Date: 5/30/12 Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s) 5/14-30/12 Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample Date: 5/7/12 Boring #: Sample #: TP-1 NI Grid A3 Offset: NI Location: Elevation: 0-6' Sample Description: Orange Brown Fine Sandy Silty Clay (MH) Type and Specification S&ME ID # Cal Date: Type and Specification S&MEID# Cal Date: Balance (0.01 g) 3222 6/23/2011 Grooving tool 22165 12/20/2011 LL Apparatus 20230 6/23/2011 Grooving tool 5/9/2012 Oven 10844 Grooving tool Liquid Limit Pan# Plastic Limit LL 25 17 Tare #: 56 12 57 Tare Weight 15.68 16.94 14.37 14.19 13.90 A 14.00 29.24 В Wet Soil Weight + A 31.20 32.96 26.90 20.43 20.10 C Dry Soil Weight + A 25.39 26.88 23,49 21.92 18.68 18.41 D Water Weight (B-C) 5.81 6.08 5.75 4.98 1.75 1.69 E Dry Soil Weight (C-A) 9.71 9.94 9.12 7.73 4.51 4.68 % Moisture (D/E)\*100 59.8% 64.4% 37.5% F 61.2% 63.0% 37.4% # OF DROPS Ν 30 28 24 20 Moisture Contents determined bv ASTM D 2216 LL LL = F \* FACTORAve. Average 37.5% One Point Liquid Limit 66.0 N Factor Factor 20 0.974 26 1.005 64.0 0.979 21 27 1.009 % Moisture Content 22 0.985 28 1.014 23 0.99 29 1.018 62.0 24 0.995 30 1.022 000.1 25 60,0 NP, Non-Plastic Liquid Limit 62 58.0 Plastic Limit 38 Plastic Index 24 56.0 Group Symbol MH 100 15 20 25 30 35 40 # of Drops Multipoint Method 7 One-point Method Wet Preparation J Estimate the % Retained on the #40 Sieve: **Dry Preparation** Air Dried NI = Information not provided. Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Jenny 2062 15/30/2012 Jennifer Olsen Kyle Baucom Technician Name Technical Responsibility

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# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Laboratory Record Version 4.1

Client Name: A continue	Project Name:	Marshall Indu	II Industrial	Landfill	No.1 - C	ıstrial Landfill No.1 - Ceils 3 & 4						ĺ		Rej	Report Date:	5/24/12
NA   Sample 87.   Part   Deptr   Dep	Client Name:		nergy											Sam	ple Date:	5/7/2012
## NA Sample & TP44   Depth:	ient Address:			Street, (	Charlotte	, NC 282	02								Panel ID:	7
The control of the	ring #:	NA		# aldu	다	4			Depth:		-4			Perr	n Cell ID:	
Limit   26	cətian:	Grid C2		Offset				ple Desc	ription:	Brown O	range Sil	lty Clay (	CH) with F	ne Sand	71.7	
Limit   Table   Passic in Passic   Sample Conditions   Table   Sample Conditions   Table   T	tuid Limit:	57		rav. (Ass	sumed):	2.1		Sa	mple Tyr	pe: Rem	olded				og #:	
Initial Sample Conditions	astic Limit:	56	i	Plasti	c Index:			rcent Pa	ssing #2	:00	72.2%		Maximu	m Particle	Size:	#
Family (cm);   7.889   Wet Density (PCF);   11.15   Length (cm);   7.284   Div Density (PCF);   11.15   Length (cm);   7.284   Div Density (PCF);			Initial S <sub>E</sub>	) aldme	Sonditic	suc			_				inal Sam	ple Condi	itions	
Aces (cm²)   7.534   Diy Density (PCF);   B3.1   Chameler (cm²)   7.52   Diy Density (PCF);   Chameler (cm²)   21.24   Percent Soluzion:   Chameler (cm²)   21.24   Percent Soluzion:   Chameler (cm²)   21.25   Chameler (cm²)   21.24   Percent Soluzion:   Chameler (cm²)   21.25   Chameler (cm²)   21.24   Percent Soluzion:   Chameler (cm²)   21.24   Percent Soluzion:   Chameler (cm²)   Chameler	Length (c	:m):	7.68	Ð	Wet Dev	nsity (PC)		111.6		Length	(cm):		7.630	We	t Density (PCF):	120.1
Area (cm²)   32.20	Diameter	(сш):	7.30	4	Dry Der	sity (PCF	<u>ان</u>	89.1	_	Diamete	я (ст.):		7.25	5	/ Density (PCF):	91.0
Colume (cm²)   272.20	Area (cr	n²)	41.9	9	Percent	Saturatic	.E	76.4	_	Area (	(cm <sup>2</sup> )		41.34	Per	rcent Saturation:	100.0
Neelph (grams)   576.0   Void Raitor   O.471   Ory Welght (grams)   460.1   Porosity:   Dot Welght (grams)   460.1   Porosity:   Dot Welght (grams)   460.1   Porosity:   Po	Volume (	cm²)	322.2	ខ្ល						Valume	(cm <sub>3</sub> )		315.74		B-Parameter.	0.95
Meight (grams)   160.1   Parosity.   1.0   Par	Wet weight (	grams)	576.	0	Vaic	1 Ratio:		0.091	5	Vet welgh	it (grams		607.3		Void Retio:	0.653
Charles   Consolidation   Co	Dry Weight (	grams)	460.	-	ď	rosity:		0.471		ry Weigh	it (grams		460.1		Porosity:	0.460
Second   Continue	Percent Ma	isture:	25.2	2						Percent N	Aoisture:		32.0			
Table Care   1.990   Cell Pressure (pai);   O2.6   Back Pressure (psi);   O2.6   O2.6   Back Pressure (psi);   O2.6   O2	st Paramete	. <u>.</u>	Effective	Consol	idation S	tress (psi		2.5	Pell	neant Lig	uid Usec	╀	eaired Wa	ا ا	a. (cm²)	0.031416
Find   Time   C4-hr   Temperature   CC   Measurements   Time   C4-hr   Temperature   CC   Measurements   Time   C4-hr   Temperature   CC   Time   Time   C4-hr   Time   Cardent   Carden	Hg Equilibriu	m Level	1.99	0	Cell Pre	sance (pa	<u>`</u>	02.5	Ä	ack Press	sure (psi	+	80.0		a (cm²)	0.76712
End   Time   Initial   Final   Ave.   Factor   Rp1   Ra1   Rp2   Ra2   h1   h2   Gradient   Gradient   K-Value   K-Value   K-Value   L2:12   S5   S23.7   S2	Time (24	hr)	12	mperat	ture (°C			1	Measur	ements		ſ		_	K-Valu	]5
12:12 556 23.7 23.7 23.7 0.9162 4.90 1.99 4.50 1.99 36.6 31.6 4.79 4.13 1.25E-06 1.141 12:15 56 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.6 31.6 4.79 4.13 1.22E-06 1.141 12:17 54 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.6 31.6 4.79 4.13 1.22E-06 1.141 12:17 54 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.6 31.6 4.79 4.13 1.22E-06 1.141 12:18 56 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.6 31.6 4.79 4.13 1.22E-06 1.141 12:19 54 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.98 36.7 31.7 4.61 4.15 1.29E-06 1.141 12:10 544 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.98 36.7 31.7 4.91 4.15 1.29E-06 1.141  Permometer P700000 byTrautwein Soil Testing was used for permealion.  Permometer P700000 byTrautwein Soil Testing was used for permealion.  Abaterials Using a Flexible Wall Permeameter of Soil and Rock by Mass  Conductivity vs. Time	ļ	┢	Initial	Final	Ave.	Factor	Rp.1		Rp2	Raz	E	h2	Initial Gradient		Quco	<u> </u>
12:15 56 23.7 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.6 31.7 4.81 4.13 1.22E-06 1.10E  12:17 54 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.7 31.7 4.81 4.13 1.22E-06 1.10E  12:17 54 23.7 23.7 23.7 0.9162 4.90 1.98 4.50 1.99 36.7 31.7 4.81 4.15 1.20E-06 1.10E  13:10:10:10:10:10:10:10:10:10:10:10:10:10:	-1-	╀	╫	23.7		0.9162	4.90	1.99	4 50	1 99	36.6	31.6	4 79	4.13	1.25E-06	114E08
12.17   54   23.7   23.7   23.7   0.9162   4.90   1.98   4.50   1.98   35.7   31.7   4.81   4.15   1.26E-06   1.16E	-	L	+	23.7		0 9162	4 90	1 99	4.50	1 99	36.6	34	4 70	4.42	1 225.06	1 12E 05
1.16	+	╧	+		~ -		9 9	3	3 (	2 5	3 2	2 1	2.5	?	1.225-00	1.125-00
Permometer PY00000 byTrautivein Soil Testing was used for permeation.   Averages: 4.80   4.14   1.245.06   1.15	_	_	7.67	7.53	╅	0.9162	4.90	1.98	4.50	2.98	36.7	31.7	4.81	4.15	1.26E-06	1.16E-06
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Permometer P700000 byTrautwein Soil Testing was used for permeation.  Permometer P700000 byTrautwein Soil Testing was used for permeation.  D 5084: Measurement of Hydraulic Conductivity of Saturated Porous  Materials Using a Flexible Wall Permeanneter  of Soil and Rock by Mass  Conductivity of Saturated Porous  Materials Using a Flexible Wall Permeanneter  Soften of Soil and Rock by Mass  Conductivity vs. Time			Ì													
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Permometer P700000 byTrautwein Soil Testing was used for permeation.  Descriptions  Materials Using a Flexible Walt Permeameter  Of Soil and Rock by Mass  Permometer P700000 byTrautwein Soil Testing was used for permeation.  1.3E-06  Averages: 4.80 4.14 1.24E-06 1.1E  Conductivity vs. Time  Conductivity vs. Time  1.3E-06  Averages: 4.80 4.14 1.24E-06 1.1E  Conductivity vs. Time																
Permometer P700000 byTrautwein Soil Testing was used for permeation.  Conductivity vs. Time				_		7				-						
D 5216: Laboratory Determination of Water (Moisture) Conlent of Soil and Rock by Mass	_															
Orous 1.5E-06 Conductivity vs. Time Conductivity vs. Time 5.0E-06 2.0E+00 Conductivity vs. Time Conductivity v		rmameter	P70000 t	oyTrauth	vein Soil	Testing v	vas used	for perm	eation.		AVE	rages:	4.80	4.14	1,245-06	1.1E-06
070US 1.0E-06 2.0E-07 2.0E 0.0 0.0E-00	foron app.								T	!			Conduct	vity vs. Time		
0.0E+00 0.0E+00 Cumulative Time (sec.)	TM D 5084: I	Measurem	ient of Hydr	andie Ce	inductivii	or Satu	rated Po	5	ANTONIN	1,5E-Vu	L	1				
5.0E-07 0.0E+00 0 200 400 600 000 Cumulative Time (sec.)	:	Material	s Using a F	lexible \	Vali Per	neamete.	,	3	ənje	1,05-08						
0.0E+00 C 200 400 600 000 Cumulative Time (sec.)	TM D 2216; (	aboratory	, Determina	tion of ∿	Nater (M	oisture) (	Santent		' <b>\-</b> >ŧ	5,0E-07	_					
0 200 400 600 000 Cumulative Time (sec.)		of Soil a	nd Rock by	Mass		•			********	0.0E+00	1	ŀ				
Cumulative line (sec.)			Ī						<b></b>		•	200	4 (			
									ل				כת	sulative Time	(sec.)	
	chnical Resp.	ensibility:	Kyle E	<u>aucom</u>							,		Position	Ë	Project Enginee	<b>!</b>
Technical Responsibility: Kyl <u>a Baucom</u> Position: Project Engineer											1	•				

### Form No. TR-D698-2 Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report

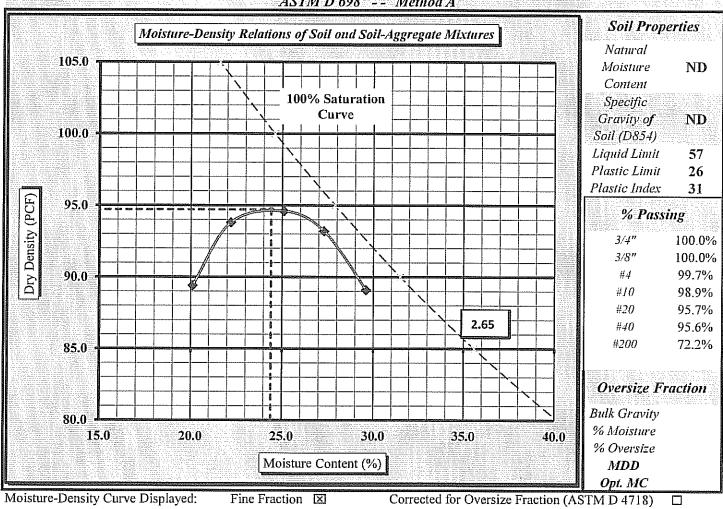


Quality Assurance

CONTRACTOR OF THE SERVICE OF A	and the second second second second	The second of th	Brokerskie Grann antologische		Marin 2200 marin CC
	S&ME, Inc. ~	9751 Southern Pine B	Soulevard ~ Ch	arlotte, NC 28273	
S&ME Project #:	1356-11-032	Phas	se 03	Report Date:	5/17/12
Project Name:	Marshall Indus	trial Landfill No. 1 - Ce	lls 3 & 4	Test Date(s):	5/15-17/12
Client Name:	Duke Energy				
Client Address:	526 South Chu	rch Street, Charlotte, N	C 28202		
Boring #:	NI	Sample #:	TP-4	Sample Date:	5/7/2012
Location:	Grid C2	Offset:	NI	Depth:	0-4'
Sample Description	on: Brown Ora	ange Silty Clay (CH) wi	th Fine Sand		

Maximum Dry Density 94.7 PCF. Optimum Moisture Content 24.4%

ASTM D 698 -- Method A



Sieve Size used to separate the Oversize Fraction: #4 Sieve 🗵 3/8 inch Sieve □ 3/4 inch Sieve □ Mechanical Rammer X Manual Rammer Moist Preparation □ Dry Preparation 🗵 References / Comments / Deviations: \*ND = Not determined \*NI = Information was not provided ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM-D 698: Enboratory Compaction Characteristics of Soll Using Standard Effort.

Kyle Baucom Technical Responsibility Signature

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Form No. TR-D698-1

Revision No. 0

Revision Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	356-11-032		Phas		Report		5/17/12
	arshall Industria	Landfill No	. 1 - Cells 3 o	<u>&amp; 4</u>	Test D	ate(s)	5/15-17/12
	nke Energy						
	26 South Church				1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Boring #: N			mple #:	TP-4	Sample		5/7/2012
	rid C2		Offset:	NI		epth:	0-4'
Sample Description:	VA	range Silty C					
Type and Specification	<i>S&amp;ME IL</i> 22182	ALLES SEE SERVICE	The second secon	pe and Specificat	10n Sc	EME ID#	Cal Date:
Balance (0.1 g) Balance	22182 22182			mpaction Mold mpaction Hamm		20231 20222	1/6/2012
Straightedge	20124		/2012 Ov	Y**********	<b>51</b>	10844	6/6/2011 5/9/2012
Sieve #4			2012	<u> </u>		TO TO THE PARTY OF	31312012
Water Content				0.1 gram Readal	oility).	Check:	
ASTM D2216 ⊠	11 - mar 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	ГО Т265 🛚		ASTM D4959		1	1 D4643 □
	Water Added:	300	360	420	240	480	And the second s
	Tare #:	DLB	695	GH	JLG	99	
A. Tare Weight	A.	159.7	161.3	164.2	162.9	158.1	
B. Wet Wt + Tare W	t B.	1150.3	1180.6	1127.4	1054.1	1303.2	
C. Dry Wt. + Tare W	rt. C	970.6	975.8	920.9	905.2	1041.9	
D. Water Weight	B.C	179.7	204.8	206.5	148.9	261.3	
E. Dry Weight	C-A	810.9	814.5	756.7	742.3	883.8	
F. Moisture Conten	t 100*D/E	22.2%	25.1%	27.3%	20.1%	29.6%	
Compaction Data	Requires a	GP 5 Balance	for ASTM (1	gram or .0022 L	b: readability).	Check;	And Angeles in terms of the control
ASTM D558 🗆	ASTM D 698		TM D1557. 🗖			AA	SHTO T180
Method A 🗵	Method B	☐ Method	C. El	Method D (AS	STM 1978) 🛘	AASI	ITO Method D
G. Wt of Soil + Molo	I G	5969	6025	6031	5861	5984	
H. Wt. of Mold	H	4242	4242	4242	4242	4242	
I. Wt. of Soil (g. or ll	os.) G-H	1727	1783	1789	1619	1742	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.807	3.931	3.944	3.569	3.840	
K. Mold Volume Fac	tor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	114.6	118.3	118.7	107.4	115.5	
M. Dry Density (PCF	) L/(1+F)	93.8	94.6	93.2	89,4	89.1	
Sieve Size used to separat Mechanical Rammer References / Comments /	⊠ Manual R	ammer 🗆	#4 Siev mined *NI = Ir	Moist Prepa Mormation was not			3/4 inch Sieve eparation
			mined *NI = Ir			YIII	-paration
Jennifer O Technician N		Lunute Signa	FOber	· · · · · · · · · · · · · · · · · · ·	CET/117926 fication Type/No.		5/17/2012 Date

Technical Responsibility

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Revision Date: 02/20/08

### Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273 S&ME Project #: 1356-11-032 Phase 03 Report Date: 5/24/12 Project Name: Marshall Industrial Landfill No. 1- Cells 3 & 4 Test Date(s): 5/14/-24/12 Client Name: **Duke Energy** Address: 526 South Church Street, Charlotte, NC Boring #: NA Sample #: TP-4 Sample Date: 5/7/12 Grid C2 Location: Offset: NI Elevation: 0-4'

Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gravel:	0.3%		Silt	24.7%
Silt & Clay (% Passing #200):	72.2%	Total Sand:	27.5%		Clay	47.5%
ent Relative Density (Assumed)	2.700	Moisture Content			Colloids	
Liquid Limit	57	Plastic Limit	26		Plastic Index	31
Coarse Sand:	0.9%	Medium Sand:	3.3%		Fine Sand:	23.4%
Description of Sand and Gravel	Rounded 🗆	Angular 🔲 Hard & Dui	able 🗆	Soft	□ Weathered &	Friable 🔲
Mechanical Stirring Apparatus A	Dispersion Peri	od: 1 min. Dispersing A	gent: Sod	ium Hexa	metaphosphate:	40 g./ Liter
References / Comments / Deviations:	ASTM D 4	318, D 2487 NI = Information i	not provided.			
Technieian Name:		Date:	A 4 A	N PANA		

<u>Kyle Baucom</u> Technical Responsibility Ky/K Signature

Project Engineer
Position

5/34/12 Daie

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### Form No. TR-D422-2 Revision No. 0

### Particle Size Analysis of Soils



Revision Date: 02/20/08

1356-11-032 Phase 03

Project #:

ASTM D 422

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 5/24/12

	ed Wt.   Percent Passing	0.0 100.0%		0.0 (washed) 100.0%				Soil Mortar	26001	1.6 96.8% 95.7%	96.7%	7 92.5% 91.4%	0 85.7% 84.7%	73.1%		hosphate: 40 g./Liter		152H 🗵		lable∃	K X ((L/T)) <sup>1/2</sup>	0.01297	.3 0.01297 0.03083	.4 0.01297 0.01957	.9 0.01297 0.01154	.1 0.01297 0.00824	.3 0.01297 0.00587	.7 0.01282 0.00289	0.01290		
-	Sieve Refained Wt.		1.5" 0.0	1.0"	3/4" 0.0	1/2" 0.0	3/8" 0.0		#10 4.4	#20 1.	1.6	3.7	#100 7.0	#200 13.2		Sodium Hexametaphosphate:	3901 Cal		EĤ	P (total) = Depth	Px%Passing#10 L	65.0% 11.0	61.0%	60.0%	54.0% 11.9	51.0% 12.1	49.0% 12.3	44.0% 12.7	35.0% 13.4		
4/12	reet, Charlotte, NC	ate: 5/7/12	on: 0-4'		Assumed) 2.700		Hygroscopic   Natural	S ND	15.71	26.65	26.41	0.24	10.70	2.24%		ime: 1 min.	er: ID No.	Type: 151H	Percent Passing	P(#10) = P(#10)	(Rxa/W)x100   Px%	65.7%	61.7%	60.7%	54.6%	51.6%	769.64	44.5%	35.4%		
Test Date(s): 5/14/-24/12	526 South Church Street, Charlotte, NC	Sample Date:	Elevation:		Apparent Relative Density (Assumed)		Moisture Content Hy	Tare #	Tare Wt.	Wet Wt. + A	Dry Wt. + A	Water Wt. (B-C)	Dry Wt. (C-A)	% Moisture (100 x D/E)	☐ Hard & Durable	Dispersion Time:	Hydrometer:			nymometei	R   (R	32.50	30.50	30.00	27.00	25.50	24.50	22.00	17.50		
4	Address: 52	TP-4	NI	h Fine Sand	Apparen		Moisti		Ą		C		E Dry	% Moistur	Angular		6/23/2011		Corrections		er Correction									1318	
Idfill No. 1- Cell		Sample #:	Offset:	y Clay (CH) wit	:#.			397.11	397.11	50.04	388.50	48.94	%6'86	66.0	Rounded		Cal. Date:	Composite Correction	Uvdromotor (		β Ú	38.0 5.5	36.0 5.5	35.5 5.5	32.5 5.5	31.0 5.5	30.0	26.0 4.0	22.5 5.0	ASTM D 422, D 2487, D 4318	
Marshall Industrial Landfill No. 1- Cells 3 &	Duke Energy	NA	.≌1	n: Brown Orange Silty Clay (CH) with Fine	Beaker#:		ams):	Total Sample Air Dried Wt. + tare wt. (grams):	ple Air Dried:	Weight of Air Dried Hydrometer Sample (g):	Oried:	Oven Dried (W):		(Table 1);		tus: A 🔀	ID No. 3222	X	Term							23.0	23.0 3(	24.0	23.5		ot provided.
Project Name:	me:	Boring #:	Location: (	Sample Description:	Pan #:	Hydrometer Jar #:	Pan Tare Weight (grams):	Total Sample Air Dr	Weight of Total Sample Air Dried:	Weight of Air Dried	Total Sample Oven Dried:	Hydrometer Sample Oven Dried	% Passing #10:	Correction Factor a (Table 1):	Description of Sand & Gravel Particles	Stirring Apparatus:	Balance:	Control Cylinder	σ <b>£</b> i,		1 (Min.)		2	5	15	30	09	250	1440	References / Comments / Deviations	NI = Information not provided.

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900 Certification #

Karen Warner Technician Name 1356-11-032 Phase 03 TP-+ (0-+') Hydro.xls Page 1 of 1

Project Engineer

Revision No. 0

Revision Date: 11/20/07

### Liquid Limit, Plastic Limit, and Plastic Index



Another code ASTM D 4318 Х AASHTO T 89 AASHTO T 90 Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Project #: 1356-11-032 Phase 03 Report Date: 5/30/12 Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s) 5/14-30/12 Client Name: Duke Energy Client Address: 526 South Church Street, Charlotte, NC 28202 Boring #: NI Sample #: TP-4 Sample Date: 5/7/12 Location: Grid C2 Offset: NI Elevation: 0-4' Sample Description: Brown Orange Silty Clay (CH) with Fine Sand Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 3222 6/23/2011 Grooving tool 22165 12/20/2011 LL Apparatus 20230 6/23/2011 Grooving tool Oven 10844 5/9/2012 Grooving tool Pan# Liquid Limit Plastic Limit Tare #: WN 9 59 37 P-11 MMTare Weight 16.59 13.93 Α 15.81 15.89 12.58 16.58 В Wet Soil Weight + A 28.87 27.56 26.62 27.08 18.92 23.09 C Dry Soil Weight + A 24.50 22.01 23.20 22.84 17.61 21.72 D Water Weight (B-C) 4.37 4.61 4.36 4.24 1.31 1.37 E Dry Soil Weight (C-A) 7.91 7.39 8.08 6.95 5.03 5.14  $\mathbf{F}$ % Moisture (D/E)\*100 55.2% 57.1% 59.0% 61.0% 26.0% 26.7% N # OF DROPS 30 25 22 18 Moisture Contents determined LLLL = F \* FACTORby ASTM D 2216 Ave. Average 26.4% One Point Liquid Limit 64.0 N Factor Factor 20 0.974 26 1.005 62.0 21 0.979 27 1.009 % Moisture Content 0.985 22 28 1.014 0.99 23 29 1.018 60.0 24 0.995 30 1.022 1.000 58.0 NP, Non-Plastic Liquid Limit 57 56.0 **Plastic Limit** 26 Plastie Index 31 54.0 Group Symbol CH 10 100 15 20 25 30 35 40 # of Drops Multipoint Method J One-point Method Wet Preparation Dry Preparation Air Dried 1 Estimate the % Retained on the #40 Sieve: Notes / Deviations / References: NI = Information not provided. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Jenney JOH 25/30/2012 Jennifer Olsen Kyle Baucom Technician Name Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Laboratory Record Version 4.1

Project Neme:		Marshall Industrial Landfill No.1 - Cells 3 & 4	l Landfill	No.1 - C	ells 3 & 4								Repo	Report Date:	5/24/12
Cilent Name:	Duke Energy	nergy											Зашр	Sample Date:	5/7/2012
Client Address:	١												<u>-</u>	Panel ID:	22218
Boring #:	NA		Sample #:	上	TP-6			Depth:		0-2			Реги	Perm Cell ID:	
Location:	Grid E2		Offset:	:		San	ple Desc	ription:	Tan Orar	ge Silty	Clay (CH	Sample Description: Tan Orange Silty Clay (CH) with Fine Sand	Sand		
Liquid Limit:	82	ω	irav. (As	p. Grav. (Assumed):	2.7	2.700	S	mple Tyl	Sample Type: Remolded	olded			Log	Log #:	
Plastic Limit:	37		Plast	Plastic Index:		45 Pe	Percent Passing #200:	ssing #2	.00	82.9%		Maximun	Maximum Particle Size:	íze:	#4
	550	Initial Sample Conditions	ample	Condition	Suc			_				Final Sample Conditions	ile Condit	lons	
Length (cm)	(сш):	7,620	20	Wet De	Wet Density (PCF):	i	106.0		Length (cm):	(cm):	_	7.620	Wet	Wet Density (PCF):	114.7
Diameter (cm)	г (ст):	7.284	94	Dry De	Dry Density (PCF);	<u>:</u>	79.9		Diameter (cm)	ır (cm):		7.26	- Pr	Dry Density (PCF):	79.9
Area (cm²)	cm <sup>2</sup> )	41.67	29	Percen	Percent Saturation:	  -  -	79.8		Area (cm²)	(cm²)	_	41.66	Perc	Percent Saturation:	100.0
Volume (cm³	(cm³)	317.54	54			_		-	Volume (cm <sup>3</sup> )	(cm <sub>3</sub> )		317.48	œ ·	B-Parameter:	96.0
Wet weight (grams)	(grams)	539.6	9.1	\   	Vold Ratio:	_	1.110	5	Wet weight (grams)	it (grams		583,4		Vold Ratio:	1.110
Dry Weight (grams)	(grams)	406.3	.3	P.	Porosity:		0.626	0	Dry Weight (grams)	t (grams		406.3		Porosity:	0.626
Percent Moisture	olsture:	32.8	. 8			- 1			Percent Moisture:	Aoisture:	1200	43.6	100		
Test Parameters:	ere:	Effectiv	е Сопѕо	Mostion 5	Effective Consolidation Stress (psi):	):	2.6	Pen	Permeant Liquid Used:	uld Used	$\vdash$	Dealred Water	٦.	<sub>віп</sub> (ст²)	0.031416
Hg Equilibrium Level	um Level	1.990	06	Cell Pre	Cell Pressure (psl):	Ë	82.6·	ď	Back Pressure (psl):	sure (psl)		80.0		a <sub>nut</sub> (cm²)	0.76712
Time (24-hr)	(4-hr)	Ĕ	empera	Temperature (°C)	3)		: :	Measurements	ements					K-Value	E
Start End	1 Time (sec)	In It	Final	Ave.	Factor	Rp1	Ra1	Rp2	Ra2	Ξ	hZ	Gradient	Gradient	Uncorrected K-Value	Corrected K-Value
9:49 6:51	╁╌	23.5	23.5	23.5	0.9204	4.90	1.98	4.50	1.99	36.7	31.7	4.82	4.16	B.56E-07	6.04E-07
9:05 8:07	7 101	8	23.5	23.5	0.9204	4.80	1.99	4.50	1.98	36.7	31.7	4.82	4.16	6.69E-07	6.15E-07
60:8	9 102	+	23.5	23.5	0.9204	4.80	1.98	4.50	1.98	36.7	31.7	4.82	4.16	6.62E-07	6.09E-07
9:11 9:12	101	23.5	23.5	23.5	0.9204	4.90	1.98	4.50	1.98	36.7	31.7	4.82	4.16	6.99E-07	6.15E-07
										:					
	14-0	11.0	2												
-	- 27	-													
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	1														
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_	Sec. 1														
Notes: F	Permometer P700	r P700000	byTraut	wefn Soll	000 by Trautwein Soll Testing was used for permeetion.	vas used	for perm	eetion.		AVE	Averages:	4.82	4.16	6.64E-07	6.1E-07
	75.4											Conductiv	Conductivity vs. Time		
References: ASTM D 5094: Measurement of Hydraulic Conductivity of Saturated Porous	: Measuren	nent of Hyd	iraulic C	onductiv	ity of Satu	rated Po	SNOJ	0	6,2E-07	American Services	<b>  &lt;</b>				
Materials Using a Flexible Wall Permeameter ASTM D 2216: Laboratory Determination of Water (Moisture) Content	Materia : Laborator	Materials Using a Flexible Wall Permeameter iboratory Determination of Water (Moisture) C	Flexible lation of	Wall Per Water (N	meamete foisture) (	r Sontent	-	K-Valu	6.1E-07		\	>			
	of Soil a	of Soil and Rock by Mass	y Mass						6.0E-07	1.	- 52	400	0	800 800	1000
												Cru	Cumulative Time (sec.)		
								•							

Technician: Karen Wamer
Technical Responsibility: Kyle Baucom

Signature

Project Engineer

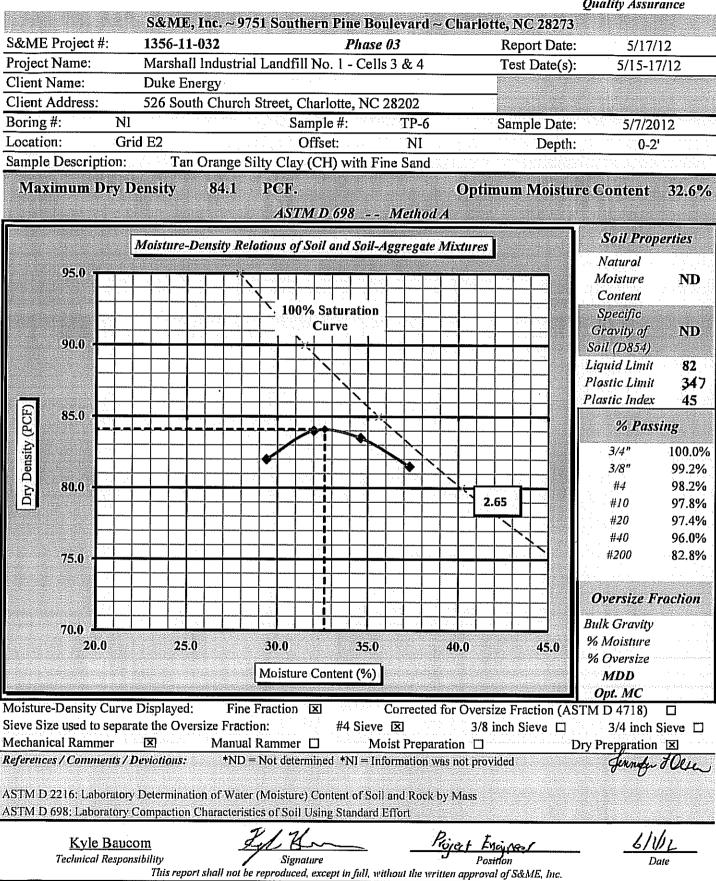
Signature FLM Postition:

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance



Revisian Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	S&ME, Inc.	~9751 South	iern Pine Boi	ilevard ~ Cha	irlotte, NC 28	273		
	56-11-032	htermichtingeners für generorsen einführer, weit fichte eine Zeite	Phase		Report I	ate:	5/17/12	Narri Cara
Project Name: Ma	arshall Industrial	l Landfill No.	1 - Cells 3 &	4	Test Da	te(s)	5/15-17/12	
Client Name: Du	ike Energy		the second					
Client Address: 52	6 South Church	Street, Charle	otte, NC 2820	2				1694 1694 1694 1694 1694 1694 1694 1694
Boring #: N1	Lateria de la composición dela composición de la composición de la composición de la composición de la composición dela composición de la composición dela composición dela composición de la composición de la composición dela composición	Sa	mple #:	TP-6	Sample I	ate:	5/7/2012	
	id E2		Offset:	NI	D€	pth:	0-2'	<u> </u>
Sample Description:			(CH) with Fir					
Type and Specification				and Specificat		ME ID#	Cal Date:	
Balance (0.1 g)	22182		ANALIST DAY OF A SHOW A LOWER TO A SHOW IN THE REAL PROPERTY OF THE PARTY OF THE PA	paction Mold	IMPRIMED LIMITACIO COMO LOCUIMORIO INTELIDIZADIO	20231	1/6/2012	900ErGAN cum/Private
Balance Straightedge	22182 20124		2011 Com 2012 Over	paction Hamme	Z20004/2000/212000/21202/2007/2007/2007	20222 10844	6/6/2011 5/9/2012	\$60653390354054
Sieve #4	10939		2012 Ove. 2012	u.		10044	3/9/2012	•
Water Content			2 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00 20-00	.1 gram Readal	sility)	Check:		
ASTM D2216 ⊠		TO T265 □		ASTM D4959			M D4643 □	
	Water Added:	240	300	360	420			
	Tare #:	5 <b>F</b>	SR	THAI	5A			
A. Tare Weight	A.	158.2	163.6	154.6	159.9	Demand (4302/1740/072) Decommend	ENERGY CONTRACTOR OF THE STATE	SMEDOUCH AND
B. Wet Wt + Tare W	t B.	1061.7	1084.5	1106.0	1119.0			
C. Dry Wt. + Tare W	/t. C.	856.3	861.1	861.4	858.6			
D. Water Weight	B-C	205.4	223.4	244.6	260.4			
E. Dry Weight	C-A	698.1	697.5	706.8	698.7	\$ 100		
F. Moisture Conten	t 100*D/E	29.4%	32.0%	34.6%	37.3%			
Compaction Data	Sale transfer transfer and an analysis of the sale of	***			b. readability).	Check:		
ASTM D558 □	ASTM D 698		TM D1557 🔲	AASHTO	•	A	ASHTO T180	
Method A ⊠	Method B	☑ Method	СП	Method D (A	STM 1978) 🗆	AA	SHTO Method D	) <u>[</u>
G. Wt of Soil + Mole	i G.	5842	5914	5937	5929			
H. Wt. of Mold	Ħ.	4242	4242	4242	4242			
1. Wt. of Soil (g. or ll	os.) G-H	1600	1672	1695	1687			
J. Wt of Soil (Lbs.)	1/453,6 or I	3.527	3.686	3.737	3.719			1
K. Mold Volume Fac	ctor K.	30.09	30.09	30.09	30.09	* * * *		
L. Wet Density (PCF)	J*K	106.1	110.9	112.4	111.9			
M. Dry Density (PCF	<sup>7</sup> ) <b>L/(1+F)</b>	82.0	84.0	83.5	81.5			
Sieve Size used to separat			#4 Sieve	Charles and the control of the contr	3/8 inch Sieve		3/4 inch Sieve	3 <b></b>
Mechanical Rammer	Manual I	eneman No. administration of the control of a few Period of the control of the co		Moist Prep		Dry.	Preparation	X.
References / Comments /	Deviations:	ND = Not deter	mined *NI = Inf	formation was no	t provided			
		<u> </u>						
		- 0	·	**************************************			* * * * * * * * * * * * * * * * * * * *	· ·
		χ.	10-1					

Jennifer Olsen

Technician Name

Signature

NICET/117926 Certification Type/No. 5/17/2012 Date

Kyle Baucom
Technical Responsibility

Project Engineer

6/1//2 Date

### Form No. TR-D422-2

Revision Date: 02/20/08 Revision No. 0

Particle Size Analysis of Soils



**ASTM D 422** 

 ${
m K}_{
m X}$   $({
m L}/{
m D})^{{
m I}_{
m Z}}$ 100.0% %0.00<sub>1</sub> 100.0% 100.0% 0.04116 99.2% 97.8% 94.1% 0.00566 00.0% 0.01126 0.00799 0.00119 98.2% 97.4% %0.96 %8.06 82.8% Diameter 0.02969 0.01907 0.00279 Percent Passing 40 g./Liter 2 3/25/2012 Soil Mortar 100.0%0.01297 (washed) 98.1% 96.1% 84.6% 0.01297 0.01297 99.5% 92.8% Table 3 0.01297 0.01297 0.01290 0.01282 0.01290 Pan# Weathered & Friable × Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H Effective Depth 10.5 10.8 11.4 11.5 0.0 0.0 2.6 7.0 11.3 12.2 0.0 0.0 8.9 0.2 0.0 3.3 10.1 5.5 1.8 Sieve #200 Px%Passing#10 #1003.0" .... ..8/€ #20 #40 3/4" 0[# 1/2" 09# 1:01 4 %9.08 75.3% 71.1% 64.7% 63.7% 61.5% 57.3% 53.1% 3901 S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273 P (fotal) Soft 151H Dercent Passing 2,700 Natural Charlotte, NC 2 5/7/12 57 Immi  $(\mathbf{R} \mathbf{x} \mathbf{a}/\mathbf{W}) \mathbf{x} \mathbf{100}$ DNo. Apparent Relative Deosity (Assumed) Hygroscopic P(#10)= 77.0% 72.7% 65.1% 62.9% 82.4% 66.2% 58.6% 54.2% 13.93 25.03 24.05 10.12 9.68% 0.98 526 South Church Street, 57 Hard & Durable Dispersion Time: 5/14/-24/12 Sample Date: Hydrometer: Elevation: Report Date: 5/24/12 Hydrometer % Moisture  $(100 \times D/E)$ (C-A) Water Wt. (B-C) 35.50 33.50 30.50 30.00 29.00 27.00 25.00 Moisture Content 38.00 Wet Wt. + A Dry Wt. + A Test Date(s): Tare Wt. Tare# Dry Wt. Composite Correction 6/23/2011 Address: Angular Corrections Sample Description: Tan Orange Silty Clay (CH) with Fine Sand O ∢ m Δ ш Marshall Industrial Landfill No. 1- Cells 3 & 4 TP-6 ASTM D 422, D 2487, D 4318  $\mathbb{Z}$ Control Cylinder Cal. Date: 5.0 5.5 314.36 5.5 5.5 5.5 4.0 344.15 97.8% Composite Correction 344.15 50.06 45.64 0.99 Sample #: Offset: Rounded Hydrometer Reading 41.0 34.0 43.5 39.0 36.0 35.5 31.0 30.0 Beaker#: Total Sample Air Dried Wt. + tare wt. (grams): 1356-11-032 Phase 03 Weight of Air Dried Hydrometer Sample (g): 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations (0.5 °C) Temp. NI = Information not provided. 23.5 23.0 23.0 23.0 23.5 24.0 23.0 Correction Factor a (Table 1): **d** × Grid E2 DNo. otal Sample Oven Dried: Stirring Apparatus: Pan Tare Weight (grams): NA Control Cylinder Hydrometer Jar #: Project Name: % Passing #10: T (Min.) Client Name: Balance: Time 1440 250 9 2 30 Project #: S \_ocation: Boring #: C Pan#:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

1356-11-032 Phase 03 TP-6 (0-2') Hydro.xls

Project Engineer

Technical Responsibility

Kyle Baucom

NICET 117900

Karen Warner

Peclinician Name

Certification #

Poge 1 of 1

Revision No. 0

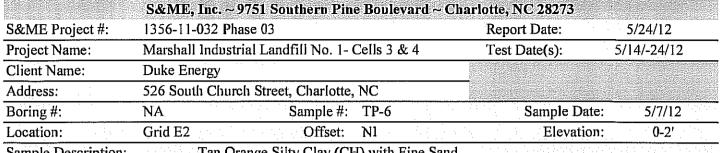
Revision Dote: 02/20/08

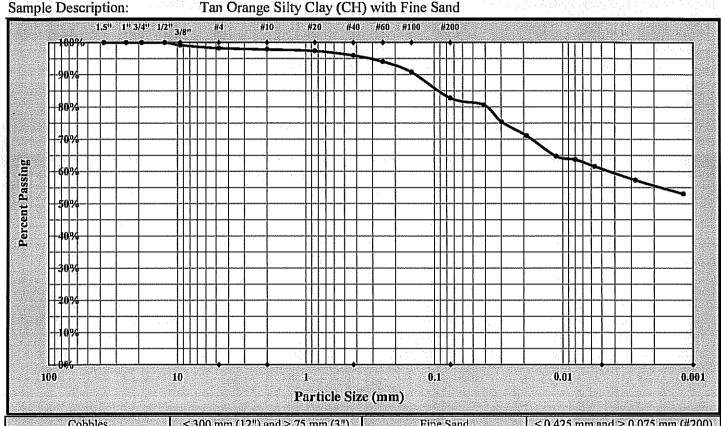
### Particle Size Analysis of Soils



ASTM D422

Quality Assurance





Silt & Clay (% Passing #7	2001 82 8%	Total Sand: 15.5%	Clay 61.5%
Maximum Particle S	Size: 3/8"	Gravel: 1.8%	Silt 21.3%
Medium Sand	<2,00 mm and > 0,425 mm (#4	0) Colloids	<0.001 mm
Coarse Sand	<4.75 mm and >2.00 mm (#10	) Clay	<0.005 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Cobbles	$\leq$ 300 mm (12") and $\geq$ 75 mm (3	(") Fine Sand	< 0.425 mm and > 0.075 mm (#200)

MILLIAMENT I MI GOTO DIZO.	210	Clare	/1.	U	21.270
Silt & Clay (% Passing #200):	82.8%	Total San	d: 15.59	% Clay	61.5%
ent Relative Density (Assumed)	2.700	Moisture Conte	nt	Colloids	
Liquid Limit	82	Plastic Lim	it 37	Plastic Index	45
Coarse Sand:	0.4%	Medium San	d: 1.99	6 Fine Sand:	: 13.2%
Description of Sand and Gravel	Rounded 🗆	Angular 🗆 Hard	& Durable 🛭	□ Soft □ Weathere	d & Friable - □
Mechanical Stirring Apparatus A	Dispersion Po	eriod: 1 min. Disper	rsing Agent:	Sodium Hexametaphosphate:	40 g./ Liter
References / Comments / Deviations:	ASTM D	4318, D 2487 NI = Inform	nation not provid	led	

Kyle Baucom

Date:

Technician Name:

Technical Responsibility

Project Engineer Position

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Client code

Client Test #

state #

Revisian No. 0

Revision Date: 11/20/07

### Liquid Limit, Plastic Limit, and Plastic Index

	#: 1356-11 <b>-032</b>	And the second of the second o		Phase	03	and the second of the second o	Report I	Date:	5/31/1	2
roject N	Name: Marshall Industria	ıl Landfil	l No. 1 - (	Cells 3 &	4		Test Da	ite(s)	5/14-31	/12
lient Na	ame: Duke Energy									
lient A	ddress: 526 South Church	Street, C	harlotte,	NC 2820	2					
oring#		Samp	le #: TP-	6		Sam	ple Date:	5/7/12		
ocation	: Grid E2	Of	fset: NI		- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	Е	levation:	0-2'		
mple I	Description: Tan Ora	nge Silty	Clay (CH	) with Fi	ne Sand	Education (Control				-:14.4
A CONTRACTOR OF THE PARTY OF TH	Specification S&ME I	D#	Cal Date:	Туре	and Specif	ication	S&	ME ID#	Cal 1	Date:
PARTITION OF SHIP, THE P	(0,01 g) 3222	SAACHARANCI MENINAMENTA TANDANA	6/23/2011	In all and it will be the second to the seco	ving tool			22165	12/20	/2011
Appar			6/23/2011	-77, (print) (million) manipul (print)	viog tool		10 10 10			
ren Pan#	1084	<del>1</del>	5/9/2012	The state of the s	oving tool				DI WELL	
-гап н	Tare#:	56	LL	17	Limit MM			6	Plastic Limit NN	
Α	Tare Weight	15.69	16.96	14.00	16.57			14.04	15.31	
В	Wet Soil Weight + A	25.88	28.44	24.92	27.97			20.29	22.22	
C	Dry Soil Weight + A	21.40	23.27	19.93	22.67	<u> </u>	<del>er veli a i estel</del> Le a veli a i delj	18.62	20.37	ann an an Na Nobel
D	Water Weight (B-C)	4.48	5.17	4.99	5.30			1.67	1.85	e te ses
E	Dry Soil Weight (C-A)	5.71	6.31	5.93	6.10	1.1.		4.58	5.06	
F	% Moisture (D/E)*100	78.5%	81.9%	84.1%	86.9%			36.5%	36.6%	1.5
	# OF DROPS	32		10.0	And Committee of the					
N		32	26	22	17			Charles of the second state of the second stat	Contents de ASTM D 22	KENTEN DARKER & POSTS
LL	LL=F*FACTOR							by a		10
ive.	Average							Osa Daist I	36.6%	2.00
88	8.0					<b> )</b>	N	One Point L	N	Fact
							20	0.974	26	1.00
80	6.0			3.		<b>-</b>	21	0.979	27	1.00
ten							22	0.985	28	1.01
Content 88	1.0	. 33	-, -,,,,				23	0.99	29	1.01
e)							24	0,995	30	1.02
Moistur 85	2.0	<b>V</b> -					25 NII	1.000   P. Non-Pla	vat <b>i</b> a	
Ž							171	Liquid L		welling his
<u>×</u> 1 80	0.0							Plastic L		arwaran 🗓
77										apareas en acada de 1999
		<del>                                      </del>	:					Plastic In	<b>T</b>	5
7.	).U 7	25 30	35 40	ti di periodi di dipendina	propries and a second of a second	100		Group Syn		
78	10 15 20	23 30	33 40	# of I	rops			Multipoint N		J
78	10 15 20				and the second of the			One-point M	1 <i>e</i> thod	
	13 20									
/et Pre <sub>l</sub>	paration Dry Preparat	ion 🕗	Air Dri		Estimo	ate the % l		n the #40 Sie	eve:	
Vet Pre	paration Dry Preparat				Estimo	ate the % i			eve:	
Vet Pre	paration Dry Preparat	ion 🕗			Estimo	ate the %			eve:	

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Technical Responsibility

Technician Name

Date



# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Laboratory Record Version 4.1

billy Street, C Sample #: Sample #: Sample #: Offset, C Offset, C Offset, Sp. Grav. (Ass T.736	2.700 2.700 34 7 (PCF): uration:				1.		Sam.		5/7/2012
Sample #: Offset   Cample #: Offset   Offset	2.700 2.700 34 (PCF): (PCF): uration:								
Sample #:  Sp. Grav. (Ass Plastic Initial Sample C 7.736 7.736 7.289 41.73 322.78 669.3 669.3 450.1 1.990 1.990	2.700 34 (PCF): (PCF): uration: uration:						4		222.19
Offset:	2.700 34 34 (PCF): (PCF): uration: uration:	_	Depth:	4			Perr	Perm Cell ID:	
Sp. Grav. (Ass Plastic Initial Sample C 7,736 7,736 7,289 41,73 322.78 669.3 450.1 26.6 Effective Consol 1,990	2.7 / (PCF urratio	Sample Description: Orange Brown Silty Clay (CH) with Fine Sand	ntion: Oral	nge Brown S	Silty Clay (	CH) with Fir	e Sand		
Plasik  1.7.36  7.736  7.289  7.289  41.73  322.78  669.3  669.3  669.3  1.990  1.990	(PCF)	Sam	Sample Type: Remolded	Remolded			2	Lag #:	
Initial Sample Condition	sity (PCF): lity (PCF): Saturation: Ratio:	34 Percent Passing #200:	ing #200:	71.0%	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Maximur	Maximum Particle Size:	ize:	#
7.736 7.289 41.73 322.78 669.3 669.3 450.1 28.6 Effective Consoil 1.990	illy (PCF): ity (PCF): saturation:					Final Sample Conditions	ie Condit	lons	
7.289 41.73 322.78 669.3 669.3 450.1 28.6 Effective Consoil 1,990	ity (PCF): saturation: Ratio:	110.1	Te Te	Length (cm):		7.643	Wet	Wet Density (PCF):	120.5
41.73 322.78 669.3 450.1 28.6 Effective Consoil 1,990	isturation: Ratio:	87.0	E C	Diameter (cm):		7.20	à	Dry Density (PCF):	90.3
322.78 669.3 450.1 28.6 Effective Consoll 1,990	Ratio:	76.4		Area (cm²)		40.72	Per	Percent Saturation:	100.0
669.3 450.1 28.6 Effective Consol 1,990	Ratio:		2	Volume (cm <sup>3</sup> )		311.20	m -	B-Parameter.	0.95
26.5 Effective Consoling Temperate		0.936	Wetw	Wet weight (grams)	(51	600.8		Void Ratfo:	0.867
Effective Consoli	osity:	0.484	ر ا	Ory Weight (grams)	13)	450.1		Pomsity:	0.464
Effective Consoli			Perc	Percent Maisture:		33.6		•	
1.990 Temperat	ess (osi):	2.6	Реплеап	Permeant Linuid Lised	ł	Dealred Water	-	a. (cm²)	0.031416
Temperat	sure (pst):	82.5	Back	Back Pressure (psi)	+	80.0		a (cm²)	0.76712
1-141-1		100	Measurements	ints				K-Value (cm/sec)	cm/sec)
Initial Final Ave.	Factor Rp1	Ra1	Rp2 Ra2	12 h1	h2	Initial Gradient	Final Gradient	Uncorrected	Corrected
23.8 23.8 23.9	0.8140 4.80	1.88	4.50 1.88	36.7	31.7	4.80	4.15	6.08E-07	5.56E-07
23.8 23.8 23.6	1 :	1.98	H	╁	31.7	4.80	4.15	6.08E-07	5.56E-07
23.8		1.98	╀	╁	31.7	4.80	4.15	6.19E-07	5.eeE-07
23.8	0.9140 4.80	1.98	4.50 1.98	$\vdash$	31.7	4.80	4.15	6.24E-07	5.71E-07
	-								
				-					
						-			
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						:	1	
Permometer P700000 byTrautwein Soil Testing was used for permeation.	esting was ust	ed for permes	tion.	Ā	Averages:	.4.80	4.15	6.15E-07	5.6E-07
	1					Conductiv	Conductivity vs. Time		
References: ASTM D 5084: Measurement of Hydraulic Conductivity of Saturater Porous	of Saturated F	Springs		5.7E-07	1000				
Materials Using a Flexible Wall Permeameter	eameter		ouleV P	S.7E-07		/			
ASTM D 2216: Laboratory Determination of Water (Moisture) Content	isture) Conten	**		5,6E-07		\			
of Soil and Rock by Mass			ž.	5.6E-07 0	- 62	. 400	0	800 800	1000
			_			Cam	Cumulative Time (sec.)		
Karen Wamer		Signature		•					2
Technical Responsibility: Kyle Baucom				4	•	Position:	¥	Project Engineer	
			Signa	Signature	11				

Technical Responsibility:

S&ME, INC., 1413 Topside Rd., Louisville, TN 37777

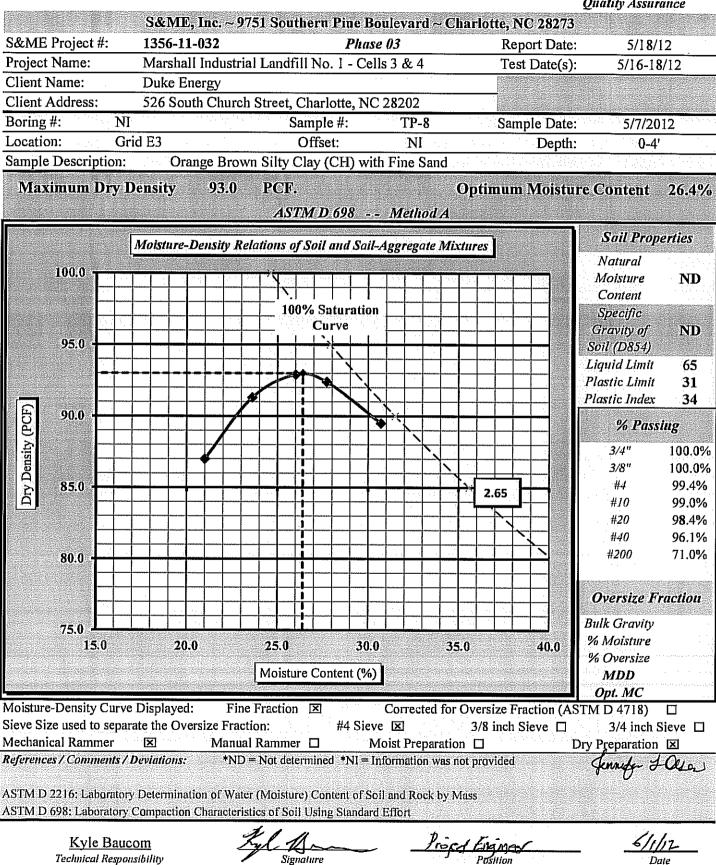
Revision No.: 0

Revision Date: 11/21/07

### Moisture - Density Report



Quality Assurance



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Revisian Date: 11/21/07

### Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	S&ME, Inc.	~ 9751 South	iern Pine Boi	ulevard ~ Cha	rlotte, NC 28	273	
Project #: 13	56-11-032	A A Tarafan v malama at 5 (mara 1920 v 1990) ar a Angele 194 (kinding oli 4 kindi	Phase	03	Report D	ate:	5/18/12
Project Name: Ma	arshall Industria	l Landfill No.	1 - Cells 3 &	. 4	Test Dat	e(s)	5/16-18/12
TATEL CO.	ike Energy	e jaron salah s					
Client Address: 52	6 South Church	Street, Charle	otte, NC 2820	2			
Boring #: NI		Sa	mple #:	TP-8	Sample D	ate:	5/7/2012
	rid E3		Offset:	Nl	De	pth:	0-4'
Sample Description:		Frown Silty Cl			ejiran merindik		
Type and Specification				e and Specificati		WE ID#	Cal Date:
Balance (0.1 g)	22182	MAY LUNGS HAND MAKE THE SAME OF THE SAME THE SAM	CENTRAL SOURCE MENTAL MANAGEMENT CONTRACT CONTRACT OF CONTRACT OF CONTRACT OF CONTRACT CONTRACT OF CONTRACT CON	npaction Mold	大学などのできるとは、100mmを大学の大学の大学では、10mmの大学の一大学	20231	1/6/2012
Balance	22182			paction Hamme		20222	6/6/2011
Straightedge	20124	A A A CONTRACTOR OF THE PARTY O	/2012 Ove	n		0844	5/9/2012
Sieve #4	10939		2012 VD 2 D-1 (f	\1 p1-1-	IV-A	Gl1	
Water Content ASTM D2216		TO T265	ir z Balance (L	).1 gram Readabi ASTM D4959	77.7	Check:	1 D4643 □
ASTIVI DZZ IO	Water Added:	Name	360	420	240	180	/LD4043 LL
	Tare #:	500 5I	AMRL	KO KO	5E	699	
A. Tare Weight	1αιо π.	162.8	163.6	165.3	157.6	155.4	
B. Wet Wt + Tare W	ESSCERO/SER SERVICE	1127.9	1109.7	1141.6	1146.1	1174.6	
C. Dry Wt. + Tare W	Eratore Caro	928.8	904.4	912.2	957.3	997.8	
D. Water Weight	B-C	199.1	205.3	229.4	188.8	176.8	
E. Dry Weight	C-A	766.0	740.8	746.9	799.7	842.4	
F. Moisture Conten	NEW PERSONS AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDR	26.0%	27.7%	30.7%	23.6%	21.0%	
Compaction Data	ENWARDICECHNORESCHOXCOK.	4 3 4 4 4 1		gram or .0022 Lb	4 5 4 5 5	Check:	
ASTM D558 □	ASTM D 698		TM D1557 🗆	AASHTO			SHTO T180 🗆
Method A 🗵	Method B		C 🗆	Method D (AS	TM 1978) 🗆		TO Method D 🗆
G. Wt of Soil + Molo	G,	6008	6020	6006	5943	5829	ustra turi
H. Wt. of Mold	Н.	4242	4242	4242	4242	4242	
1. Wt. of Soil (g. or ll	os.) G-H	1766	1778	1764	1701	1587	
J. Wt of Soil (Lbs.)	1/453.6 or I	3.893	3.920	3.889	3.750	3.499	
K. Mold Volume Fac	etor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	J*K	117.1	118.0	117.0	112.8	105.3	
M. Dry Density (PCF	) L/(1+F)	92.9	92.4	89.5	91.3	87.0	
Sieve Size used to separat Mechanical Rammer	e the Oversize Frac  Manual		#4 Sieve	Moist Prepa	3/8 inch Sieve		3/4 inch Sieve □ reparation 区
References / Comments /	Continue of a Contract contract contract to the best of the first	Commission to the commission of the commission o	rmined *NI = In	formation was not		energe et de Jatel	-L
				. + 1			
<u>Jennifer C</u> Technicion N		Jennety.	LOSEN ature		CET/117926 Scation Type/No.		5/18/2012 Date

Kyle Baucom Technical Responsibility

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### Form Na. TR-D422-2

Revisian Na. 0

Revision Date: 02/20/08

## Particle Size Analysis of Soils

ASTM D 422



					1						
			S&ME, Inc.	.~9751 Som	thern Pine Bo	S&ME, Inc. ~9751 Southern Pine Boulevard ~ Charlotte, NC 28273	riotte, NC 28	273			
Project #:	1356-11-032 Phase 03	ase 03		Re	Report Date:	5/24/12					
Project Name:	Marshall Industrial		Landfill No. 1- Cells 3 & 4		Test Date(s):	5/14/-24/12					
Client Name:	Duke Energy			Address:	526 South Church Street,	urch Street, Cha	Charlotte, NC	Sieve	Retained Wt.	Percent Passing	assing
Boring #:	NA	Sau	Sample #:	TP-8	Sar	Sample Date:	5/7/12	3:0"	0.0	# FOC	100.0%
Location:	Grid E3	14.	Offset:	IN		Elevation:	.5-0	1.5"	0.0	Fall# (minched)	100.0%
Sample Description:	tion: Orange Brown Silty Clay (CH) with Fine	wn Silty Cla	y (CH) with	Fine Sand				""OʻT	0.0	(wasuccu)	100.0%
Pan#:		Beaker#:		10252744	ent Relative D	Apparent Relative Density (Assumed)	i) 2.700	3/4"	0.0		100.0%
Hydrometer Jar #:								1/2"	0.0		100.0%
Pan Tare Weight (grams):	(grams):			Moi	Moisture Content	Hygroscopic	c Natural	- 18/E	0.0	Coll & Contour	100.0%
Total Sample Air	Total Sample Air Dried Wt. + tare wt.	(grams):	335.61		Tare #	L	R	7#	1.9		99.4%
Weight of Total Sample Air Dried.	ample Air Dried:		335.61	W.	Tare Wt.	15.94		#10	3.1	100.0%	%0.66
Weight of Air Dri	Weight of Air Dried Hydrometer Sample (g):	ole (g):	50.03	В	Wet Wt. + A	26.67		#20	0.3	99.4%	98.4%
Total Sample Oven Dried:	n Dried:		319.49	O	Dry Wt. + A	26.15		#40	1.4	97.1%	96.1%
Hydrometer Sample Oven Dried	le Oven Dried (W):		47.61	M Q	Water Wt. (B-C)	0.52		09#	4.7	90.2%	89.3%
% Passing #10:	The state of the s	- 1	%0.66	П	Dry Wt. (C-A)	10.21		#100	8.5	82.1%	81.4%
Correction Factor a (Table 1):	a (Table 1):		0.99	% Mois	% Moisture (100 x D/E)	3) 5.09%		#200	13.5	71.7%	71.0%
Description of Sar	Description of Sand & Gravel Particles	s Rounded	□ Pe	Angular	∏ Har	Hard & Durable	□ Soft		Weathered & Friable	1:2	
Stirring Apparatus:	A	B B	□		Disp	Dispersion Time:	1 min. S	Sodium Hexa	Sodium Hexametaphosphate:		
Balance:	Zo.	3222	Cal. Date:	6/23/2011	П	Hydrometer:	ID No. 3	3901	Cal. Date:	3/25/2012	
Control Cylinder	der 🗵	Composite	Composite Correction			Type:	151H	D	152H	X	
Minima is a distribution of the second of th	of Terms	Hydrometer		orrecti	Hvdrometer		reeot Pass		Effective	Table 3	Diameter
					1	- T		P(total) = 0	Depth		
(Win:)	(0.5 (0)	Keading	Cymaer	r (Jouredian	93644	A LIKEN	ALC:	HSSIII GHTO		S. Colonia de Colonia	N.X.(LIMIL)
	23.5	38.0	5.0		33.00		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	68.0%	10.9	0.01290	0.04254
7	23.5	36.0	5.0		31.00	64.5%		63.8%	11.2	0.01290	0.03053
5	2.5	32.0	0.5		27.00			55.6%	11.9	#N/A	#N/A
15	23.5	30.5	2.0		25.50	53.0%		52.5%	12.1	0.01290	0.01159
30	23.5	29.0	2:0		24.00	46.6%		49.4%	12.4	0.01290	0.00828
09	23.5	27.0	5:0		22.00	45.8%		45.3%	12.7	0.01290	0.00593
250	24.0	24.5	4.0		20.50	42.6%		42.2%	12.9	0.01282	0.00292
1440	23.5	22.0	2:0		17.00	35.4%	man and the	35.0%	13.5	0.01290	0.00125
References / Camments / Deviations	tents / Deviations	ASTM D 422	ASTM D 422, D 2487, D 4318	318							
NI = Information not provded.	not provded.										
											11.1

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh, N.C. 27616

Technical Responsibility

Kyle Bancom

NICET 117900 Certification #

Karen Warner Technician Name

1356-11-032 Phase 03 TP-8 (0-4') Hydro.xls Page 1 of 1

Project Engineer Position

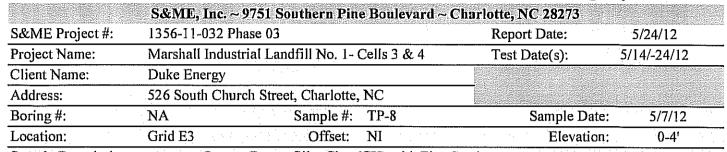
Revision Date: 02/20/08

### Particle Size Analysis of Soils

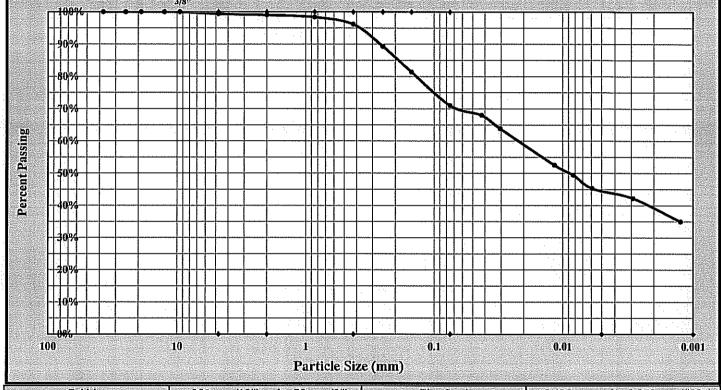


ASTM D422

Quality Assurance



Sample Description: Orange Brown Silty Clay (CH) with Fine Sand . LS" 1"3/4" 1/2"<sub>3/8"</sub> #10 #40 #60 #100



Cobbles	<300 mm (12") and > 75 mm (3")	Fine Sand	< 0,425 mm and > 0,075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	<0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	<0.001 mm

Maximum Particle Size:	#4	Grave	el: 0.6%		Silt	26.5%
Silt & Clay (% Passing #200):	71.0%	Total San	d: 28.4%	6	Clay	44.5%
ent Relative Density (Assumed)	2.700	Moisture Conte	nt	entrones and and a second state of the second	Colloids	error superpulsation of first
Liquid Limit	65	Plastic Lin	nit 31	Plast	ic Index	34
Coarse Sand:	0.4%	Medium San	d: 2.9%	, Fin	ne Sand:	25.2%
Description of Sand and Gravel	Rounded 🗖	Angular □ Hard	& Durable 🗆	l Soft □	Weathered	& Friable 🗆
Mechanical Stirring Apparatus A	Dispersion Pe	riod: 1 min. Dispe	rsing Agent:	Sodium Hexametaph	osphate:	40 g./ Liter
References / Comments / Deviations:	ASTM D	4318, D 2487 NI = Inform	nation not provid	ed		
Technician Name:			Date:			

Kyle Baucom Technical Responsibility

Project Engineer Position

4/1/12

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Client cade

Client Test #

state #

Revision No. 0

Revision Date: 11/20/07

### Liquid Limit, Plastic Limit, and Plastic Index

Another code ASTM D 4318 X AASHTO T 89 AASHTO T 90 Onality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Project #: Phase 03 1356-11-032 Report Date: 5/31/12 Marshall Industrial Landfill No. 1 - Cells 3 & 4 Project Name: Test Date(s) 5/14-31/12 Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Boring #: NI Sample #: TP-8 Sample Date: 5/7/12 Offset: NI Grid E3 Location: Elevation: 0-4' Sample Description: Orange Brown Silty Clay (CH) with Fine Sand Type and Specification S&ME ID# Col Date: Type and Specification S&ME ID # Cal Date: Balance (0.01 g) 3222 Grooving tool 6/23/2011 22165 12/20/2011 LL Apparatus 20230 6/23/2011 Grooving tool Oven 10844 5/9/2012 Grooving tool Pan# Liquid Limit Plastic Limit Tare #: 12 59 NN 6 25 9 37 Tare Weight 14.19 15.29 15.81 14.04 14.38 13.93 15.90 Α Wet Soil Weight + A В 28.19 26.86 27.06 24.90 25.65 20.04 22.63 C Dry Soil Weight + A 22.16 23.21 22.53 20.61 21.10 18.58 21.02 D Water Weight (B-C) 4.90 4.98 4.33 4.29 4.55 1.46 1.61 Ė Dry Soil Weight (C-A) 7.97 7.92 6.72 6.57 5.12 6.72 4.65 % Moisture (D/E)\*100  $\mathbf{F}$ 61.5% 62.9% 64.4% 65.3% 67.7% 31.4% 31.4% N # OF DROPS 34 31 25 22 19 Maisture Contents determined LL = F \* FACTOR LL by ASTM D 2216 Ave. Average 31.4% One Point Liquid Limit 70.0 N Factor N Factor 0.974 20 26 1.005 68.0 21 0.979 27 1.009 % Moisture Content 22 0.985 28 1.014 23 0.99 29 1.018 66.0 24 0.995 30 1.022 1.000 64.0 NP, Non-Plastic 368 507 Liquid Limit 65 62.0 Plastic Limit 31 Plastic Index 34 60.0 Group Symbol CH 100 15 20 25 30 35 40 # of Drops Multipoint Method [7] One-point Method Wet Preparation **Dry Preparation** Air Dried Estimate the % Retoined on the #40 Sieve: Notes / Deviations / References: N1 = Information not provided. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Jennifer Olsen Kyle Baucom

Technician Name

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Technical Responsibility

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method "F")

Laboratory Record Version 4.1

Project #:		1356-11-032	-032	Pha	Phase 03									Test	Test Date(s):	5/20-24/12
Project Name:		Marshall	Industrie	al Landfil	No.1 - C	Marshall Industrial Landfill No.1 - Cells 3 & 4							, .	Rep	Report Date:	5/24/12
Client Name:		Duke Energy					ļ							Samp	Sample Date:	5/7/2012
Cllent Address:	•	528 South Ch		h Street,	Charlotte	urch Street, Charlotte, NC 28202	.02								Penet (D:	4
Boring #:		ΑN		Sample #:		TP-9			Depth:		4-7,		:	Perm	Perm Cell ID:	
Location;		Grld H		Offset			San	Sample Description:	niption:	Tan Orai	nge Fine	Sendy C	Tan Oranga Fine Sandy Clayey Sllt (ML)	VE)		
Liquid Limit:	nıt:	40	S	p. Grav. (Assumed):	sanmed):		2.700	Se	ample Ty	Sample Type: Remolded	paplor			Lo	Log #:	
Plastic Limit	imit	32	2.4	Plast	Plastic Index:		8 P	Percent Passing #200:	ssing #2	:00	54.8%		Maximus	Maxlmum Particle Size:	jze:	#4
		***	initial S	al Sampla Conditions	Conditi	опѕ			-			1	Final Sample Conditions	ole Condil	tions	
1	Length (cm)	;;	7.7	7.791	Wet De	Wet Density (PCF):	Ë	111.8		Length (cm):	(cm):		7.791	Wet	Wet Density (PCF):	119.7
ם	Diameter (cm)	(F	7.2	7.249	Dry De	Dry Density (PCF):	Ë	88.4		Diameter (cm):	er (cm):		7.25	- P	Dry Density (PCF):	88.4
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Area (cm²)		4	41.27	Percen	Percent Saturation:	::	78.7	<u> </u>	Area (cm²)	(cm²)		41.27	Per	Percent Saturetion:	100.0
\$	Volume (cm <sup>3</sup> )	- (-) - (-)	321	321.52						Volume (cm <sup>3</sup> )	3 (cm³)		321.51		B-Parameter:	0.95
Wetw	Wet weight (grams)	ams)	25	576,8	٥	Void Ratio:	<u> </u>	0.906	^	Wet weight (grams)	nt (grams		616.3		Void Ratio:	0.906
07. ≥	Dry Weight (grams)	ams)	45	456.6	n.	Porasity:	 	0.475		Dry Weight (grams)	ıt (grams		456.6		Porosity:	0.475
Perc	Percent Moisture:	ture:	28	26.4						Percent Moisture:	Voisture:		35.3			
est Par	Test Parameters:		Effectiv	ve Consc	Mation	ective Consolidation Stress (psl)	ig.	2.6	Per	Permeant Liquid Used:	tuld Used		Deaired Water	JÐ.	a <sub>in</sub> (cm²)	0.031416
Ha Eq	Hg Equilibrium Level	Level	1.5	1.990	Cell Pr	Cell Prassura (psl):	s):	82,5	-	Back Pressure (psi)	sure (psi	- ::	0.08		a <sub>out</sub> (cm²)	0.76712
Ē	Time (24-hr)	ır)	[:] · :	Temperature (°C)	ture (°C	6			Measur	Measurements			11411	1 1 1 1	K-Valu	K-Value (cm/sec)
Start	Fnd	Time	IniHai	Final	Ave	Factor	Ro1	Ra	RoZ	Raz	Ξ	h2	Gradient	Final Gradient	Uncorrected	_
1		(sec)													K-Value	K-Value
B:-	1:00	12	23.7	23.7	23.7	0.9162		98	4.60	1.98	38.0	32.9	4.87	4.23	5.60E-06	5.13E-06
99;	80:1	12	23.7	23.7	23.7	0.9162	- 1	88 6	4.80	89 6	38.0	32.9	4.8/	4.23	3.80E-06	5.135-00
BD:-	1:08	13	23.7	7.7	73.7	0.916z		26.	4.00	26.	38.0	32.9	78.4	4.23	27.7 = 00	4.745-00
7.12	1:12	13	23.7	23.7	23.7	0.9162	5.00	88.	4.60	1.98	38.0	32.9	4.8/	4.23	5.17E-06	4.74E-UB
			3.													
													-			
		,														
		15 to							25			1.0				
Nofes:	Pen	Permometer P700	- P70000(	0 byTrau	twein Sol	1000 by Trautwein Soll Testing was used for permeation.	was used	d for pem	neation.		Av	Averages:	4.87	4.23	5.39E-06	4.9E-06
3		. / ]				*.							Conduct	Conductivity vs. Time		
References ASTM D 508	ces: 5084: M	easurem	ent of Hy	draulic C	Conductiv	References: ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous	urated Po	Spaus	90	5.2E-06 5.1E-06 5.0E-06	3.		ALUGO SE			
STMD	2216: Le	Matenal	is Using a / Determi	a Flexible Ination of	wall Pe Water (I	Matenais Using a Flexible Wall Permeameter ASTM D 2216: Laboratory Determination of Water (Moisture) Content	er Content		K-Va	4,9E-06 4.BE-06						
		of Soll and Ro	ind Rack	ock by Mass						4.7E-05		200		400	9 009	500 1000
										•			Gun	Cumulative Time (acc.)	(aoc.)	
Technician	ar:		Kai	Karen Warner				Signature						-	. !	
Technica	Technical Responsibility:	sibility:	푋	Kyle Baucom	<b>⊆</b> I								Position:	<u>:</u>	Praject Engineer	<b>.</b>

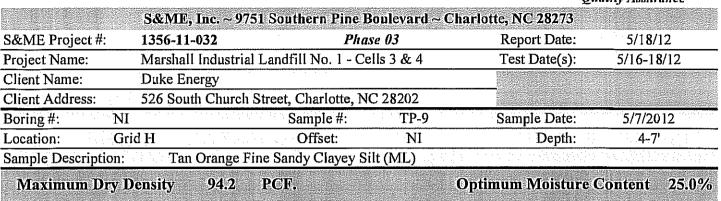
Revision No. : 0

Revision Date: 11/21/07

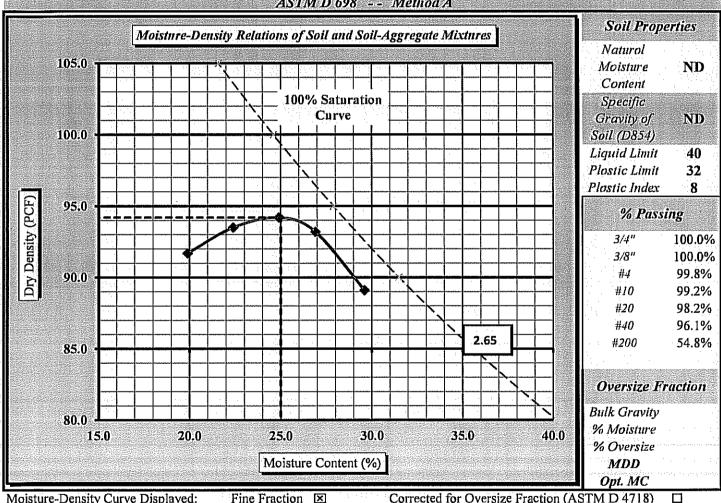
# Moisture - Density Report



**Quatity Assurance** 



ASTM D 698 -- Method A



Corrected for Oversize Fraction (ASTM D 4718) Fine Fraction 🗵 Moisture-Density Curve Displayed: Sieve Size used to separate the Oversize Fraction: #4 Sieve 🗵 3/8 inch Sieve □ 3/4 inch Sieve □ Moist Preparation □ Dry Preparation 🗵 Mechanical Rammer Manual Rammer □ \*ND = Not determined \*NI = Information was not provided References / Comments / Deviotions: ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom Teclinical Responsibility Signolure

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Revision Date: 11/21/07

# Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	S&ME, Inc.	~ 9751 South	ern Piae Bou	levard ~ Cha	rlotte, NC 28	273	
Project #: 13	356-11-032	1. On 1994 (1. V et al. 175), 4000mm (1. 15 + 17 - 40) (1. V et al. 1700) (1. V et al. 175) (1. V et al. 175)	Phase (	03	Report D		5/18/12
Project Name: M	[arshall Industria]	l Landfill No.	1 - Cells 3 &	4	Test Dat	e(s) :	5/16-18/12
	uke Energy			-			
Client Address: 52	26 South Church	Street, Charle	otte, NC 28202	2			
Boring #: N	***		mple#:	TP-9	Sample D	ate:	5/7/2012
	rid H		)ffset:	·N1	De	pth:	4-7'
Sample Description:			y Clayey Silt (			Martin Ma	
Type and Specification				and Specificati		WE ID#	Cal Date:
Balaoce (0.1 g)	22182	DESCRIPTION OF STREET	designation to any Contract Administration of the same	paction Mold	ALCOHOLOWICE TO THE PROPERTY OF THE PROPERTY O	20231	1/6/2012
Balance	22182		Spok State of the Control of the Con	pactioo Hamme		20222	6/6/2011
Straigbtedge Sieve #4	20124 10939		The state of the s	1		10844	5/9/2012
Water Contect	17.115.04.03-10.04.04.04.04.04.04.04.04.04.05.04.04.04.04.04.04.04.04.04.04.04.04.04.		100 C 600 C 100 C	.1 gram Readab	::::::::::::::::::::::::::::::::::::::	Check:	
ASTM D2216		neorrequies € TO T265 □		ASTM D4959			D4643 □
AG IM D2210 E	Water Added:	240	300	360	420	480	
	Tare #:	THAI	5F	5A	SR	698	
A. Tare Weight	A.	154.5	158.0	159.7	163.5	154.6	
B. Wet Wt + Tare W	/t B.	1111.1	1207.0	1165.0	1168.3	1097.6	
C. Dry Wt. + Tare V	Vt. C.	952.2	1015.1	964.9	955.1	882.4	
D. Water Weight	B-C	158.9	191.9	200.1	213.2	215.2	
E. Dry Weight	C-A	797.7	857.1	805.2	791.6	727.8	
F. Moisture Conter	ıt 100*D/E	19.9%	22.4%	24.9%	26.9%	29.6%	
Compaction Data	Requires a	GP 5 Balance	for ASTM (1 g	ram or .0022 L	b. readability).	Check:	
ASTM D558 □	ASTM D 698	⊠ AS	TM D1557 🔲	AASHTO	T99 🗆	AAS	SHTOT180 🗆
Method A ⊠	Method B		C 🗆		TM 1978) 🗆	Checker 100 company of the control o	TO Method D 🔲
G. Wt of Soil + Mol	d G.	5900	5968	6014	6026	5984	
H. Wt. of Mold	H.	4242	4242	4242	4242	4242	
1. Wt. of Soil (g. or I	lbs.) G-H	1658	1726	1772	1784	1742	
J. Wt of Soil (Lbs.)	I/453.6 or I	3.655	3.805	3.907	3.933	3.840	
K. Mold Volume Fa	ctor K.	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF	) J*K	110.0	114.5	117.6	118.3	115.5	
M. Dry Density (PC	petit cheep transportation for	91.7	93.5	94.2	93.2	89.1	
Sieve Size used to separa			#4 Sieve		3/8 inch Sieve		3/4 inch Sieve □
Mechanical Rammer	✓ Manual I			Moist Prepa		Dry Pre	paration 🗵
References / Comments	/ Deviations:	*ND = Not deter	mined *NI = Inf	formation was not	provided	<u> </u>	

Jennifer Olsen

Technicion Nome

21.4h

N1CET/117926
Certification Type/No.

5/18/2012 Dote

Kyle Baucom
Technical Responsibility

Signature

Position

4/1/)2 Date

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# Farm No. TR-D422-2

Revision Na. 0

Revisian Date: 02/20/08

# Particle Size Analysis of Soils

ASTM D 422



 $\overline{\mathrm{K}_{\mathrm{X}}}((\underline{\mathbb{L}}\overline{\mathbb{T}})^{\mathbb{L}^{2}}$ 100.0% 100.0% %0.00 96.1% 0.00310 100.0% 100.0% 100.0% 99.2% 98.2% 54.8% Diameter 0.04592 0.03310 0.02139 0.01257 0.00899 0.00634 0.00132 78.5% %8.66 90.4% Percent Passing 40 g./ Liter %: %: 3/25/2012 Soil Mortar 0.01290 100.0%0.01290 (washed) %0.66 55.2% %8.96 91.2% 79.1% Table 3 0.01297 0.01297 0.01297 0.01282 0.01297 0.01297 Pan# Weathered & Friable × Sodium Hexametaphosphate: Cal. Date: Retained Wt. 152H **Effective** Depth 21.0 13.6 14.4 15.0 12.5 13.0 14.5 0.0 9.8 14.7 0.0 0.0 0.5 2.4 0.0 0.5 1.5 14.1 4.1 #200 Px%Passing#10 #100 Sieve #0 1.51 #10 #20 1.01 3/4" 1/2" ...8//8 09# # k: lii. P(total) =34.6% 24.1% 42.0% 23.1% 21.0% 16.8% 48.3% 28.3% S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273 3901 Soft 151H Percent Passing Natural 2,700 526 South Church Street, Charlotte, NC 2 5/7/12 4-7 H  $(\mathbf{R} \mathbf{x} \mathbf{a} / \mathbf{W}) \mathbf{x} 100$ DNo. Apparent Relative Density (Assumed) Hygroscopic P(#10)= 21.1% 42.3% 34.9% 24.3% 23.3% 48.6% 28.6% 16.9% 6.88% 15.79 26.04 25.38 Type: 99.0 9.59 Hard & Durable Dispersion Time: 5/14/-24/12 Sample Date: Hydrometer: Elevation: Report Date: 5/24/12 Hydrometer % Moisture  $(100 \times D/E)$ (C-A) Water Wt. (B-C) 23.00 20.00 16.50 13.50 11.50 11.00 10.00 Moisture Content 8.00 Dry Wt. + A Wet Wt. + A Test Date(s): Tare Wt. Tare # Dry Wt. 2 Composite Correction 6/23/2011 Angular Address: orrections ш ¥ α C Δ Marshall Industrial Landfill No. 1- Cells 3 & 4 TP-9 Sample Description: Tan Orange Fine Sandy Clayey Silt (ML 2 ASTM D 422, D 2487, D 4318 Cylinder Control Cal. Date: 5.0 4.0 5.0 Composite Correction 5.5 5.5 5.5 5.5 5.5 322.96 302.32 99.2% 322.96 50.03 46.81 0.99 Offset: Sample #: Rounded Hydrometer Reading m 28.5 25.5 22.0 19.0 17.0 16.0 14.0 13.0 Beaker#: Total Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 1356-11-032 Phase 03 3222 × Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations Temp. NI = Information not provided.(0.5 °C) 23.0 23.0 23.5 24.0 23.0 23.0 23.0 23.5 × Correction Factor a (Table 1): DN6. Grid H otal Sample Oven Dried: Pan Tare Weight (grams): Stirring Apparatus: NA Control Cylinder **Eydrometer Jar #**: Project Name: % Passing #10: Client Name: [ (Min.) Time 1440 250 9 30 2 Project #: Boring #: ocation:

S&ME, Inc. - Corporate

3201 Spring Forest Road Raleigh. N.C. 27616

Technical Responsibility

Kyle Baucom

NICET 117900

Karen Warner

Technician Name

Certification #

1356-11-032 Phase 03 TP-9 (4-7') Hydro.xls

Project Engineer

Page I of I

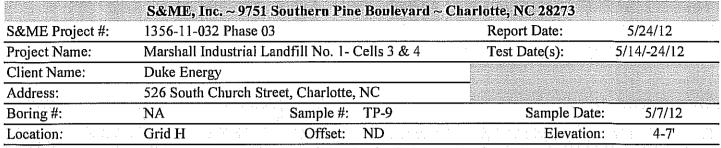
Revision Date: 02/20/08

# Particle Size Analysis of Soils

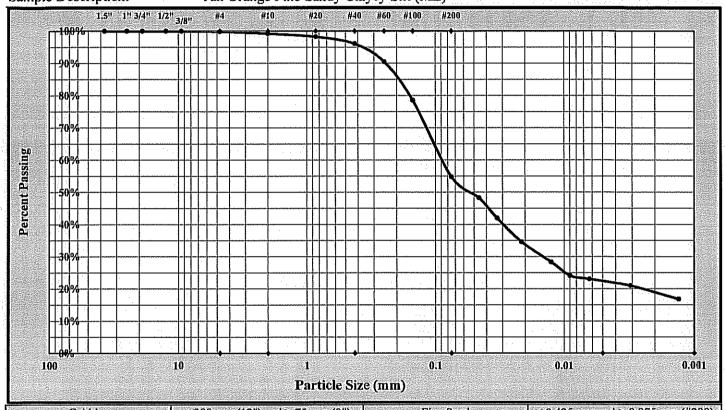


ASTM D422

Quality Assurance



Sample Description: Tan Orange Fine Sandy Clayey Silt (ML)



Cobbles	<300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	<75 mm and > 4:75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	<4,75 mm and >2,00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#4	Gra	vel: 0.	2%	Silt	31.8%
Silt & Clay (% Passing #200):	54.8%	Total Sa	nd: 45	.0%	Clay	23.0%
ent Relative Density (Assumed)	2.700	Moisture Con	ent	germania de la magnada estadore. N	Colloids	er sagesegiadeg karag aksgrung Ti
Liquid Limit	40	Plastic L	mit I	32	Plastic Index	8
Coarse Sand:	0.6%	Medium Sa	nd: 3.	2%	Fine Sand:	41.3%
Description of Sand and Gravel	Rounded 🗆	Angular 🗆 Ha	rd & Durable	□ Soft	☐ Weathered &	k Friable 🗆
Mechanical Stirring Apparatus A	Dispersion P	eriod: 1 min. Disp	ersing Agent:	Sodium He	xametaphosphate:	40 g./ Liter
References / Comments / Deviotions:	ASTM I	0 4318, D 854, D 2487				
Technician Name:			Date:			

Kyle Baucom

Technical Responsibility

Ly Ly Signature

Project Engineer

UIIIL Date

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Client code

Client Test #

state #

Revision No. 0

Revision Date: 11/20/07

# Liquid Limit, Plastic Limit, and Plastic Index

X П AASHTO T 89 AASHTO T 90 Another code ASTM D 4318 Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Phase 03 5/31/12 Report Date: Project #: 1356-11-032 Marshall Industrial Landfill No. 1 - Cells 3 & 4 Test Date(s) 5/14-31/12 Project Name: Client Name: Duke Energy 526 South Church Street, Charlotte, NC 28202 Client Address: Sample #: TP-9 Sample Date: 5/7/12 Boring #: NI Offset: NI Elevation: 4-7' Grid H Location: Tan Orange Fine Sandy Clayey Silt (ML) Sample Description: Cal Date: Type and Specification S&MEID# Type and Specification S&ME ID# Cal Date: Balance (0.01 g) 3222 6/23/2011 Grooving tool 22165 12/20/2011 LL Apparatus 20230 6/23/2011 Grooving tool 10844 5/9/2012 Grooving tool Oven Liquid Limit Plastic Limit Pan# Tare #: BB 30 TTWN P-11 Tare Weight 16.18 15.89 15.91 16.60 12.58 Α В Wet Soil Weight + A 32,23 29.17 32.47 23.59 18,76 Ċ Dry Soil Weight + A 27.75 25.27 27.36 21.89 17.26 1.70 1.50 D Water Weight (B-C) 4.48 3.90 5.11 Dry Soil Weight (C-A) 11.57 9.38 11.45 5.29 4.68 E 32.1% % Moisture (D/E)\*100 38.7% 41.6% 44.6% 32.1% F 27 22 18 # OF DROPS N Maisture Cantents determined by ASTM D 2216 ΤΤ LL = F \* FACTORAve.32.1% Average One Point Liquid Limit 46.0 Foctor Foctor 20 0.974 26 1.005 44.0 21 0.979 27 1.009 % Moisture Content 1.014 0.985 23 0.99 29 1:018 42.0 24 0.995 30 1.022 1.000 25 40.0 NP, Non-Plastic Llquid Limit 40 38.0 Plastic Limit 32 8 Plastic Index 36.0 ML Group Symbol 100 15 20 30 35 40 25 # of Drops Multipoint Method 4 One-point Method Estimate the % Retained on the #40 Sieve: Wet Preparation Dry Preparation Air Dried 7 Notes / Deviations / References: NI = Information not provided. ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Sails Jennifer Olsen Jenny JOsen 5/31/2012 Kyle Baucom Technician Name Technical Responsibility

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Methad "F")

Laboratory Record Version 4.1

Cllent Name: Du Cllent Address: 52 Boring #; Location: Gr Liquid Limit: Plastic Limit: Length (cm):	Duke Energy 526 South C	a)													
	6 South		j										Sam	Sample Date:	6/16/2012
alt nit ngth (cm		Church (	hurch Street, Charlotte, NC 28202	harlotte.	NC 282	02								Panel ID:	6
alt nit ngth (cn	¥	San	Sample #:	SE1	7			Depth:	!	9-0			Реп	Perm Cell ID:	
uid Limit stic Limit Length (cm):	Grid B3	J	Offset:	NA			ple Desc	nption:	Orange	Brown C	ey w/Co:	Sample Description: Orange Brown Cley w/Coarse to Fine Sand (CH)	Sand (CH		
stic Limit: Length (cm):	<u>و</u>	Sp. Gr.	Sp. Grav. (Assumed):	(paur	2.		ഗ്	Imple Ty	Sample Type: Remolded	Joided			ר	Log #: NA	
Length (cm):	3	18 18 T	Plastic Index:	rdex:		30 Pe	rcent Pa	Percent Passing #200:	.; 60	75.1		Maximu	Maximum Particle Size:	Size:	#
Length (cm):	lu		) eldı	onditio	ยน						- -	Final Sample Conditions	ple Cond	tions	
		7.620	:	Net Der	Wet Density (PCF):	Ë	111.9		Length (cm):	(ст):		7.870	Me	Wet Density (PCF):	108.7
Diameter (cm):	erg/	7.267		Dry Den	Dry Density (PCF):	ë	87.2		Diameter (cm)	эг (ст):		7.49	5	Dry Density (PCF):	79.4
Area (cm²)	: 40:	41.48	÷.	Percent	Percent Saturation:	:=	82.0	3.5	Area (cm²)	(cm²)		44.11	Per	Percent Saturation:	88.8
Volume (cm³)	171	316.04	4						Volume (cm <sup>3</sup> )	Cm <sup>3</sup>		347.15		B-Parameter	0.96
Wet weight (grams)	(SI	566.7		Voic	Void Ratio:		0.932	5	Vet welgt	Wet weight (grams)		604.7		Vold Retio:	1.122
Dry Welght (grams)	(5)	441.7		Poi	Porasity:		0,482		in Welch	Dry Weloht (orams)		441.7	<u> </u>	Parasity	0.629
Percent Moisture	ini	28.3				L			Percent Moisture:	Moisture:		36.9	-		
Test Parameters:	Ш		fective Consolidation Stress (psi):	ation S	ress (ps		2.5	Pen	neant Lig	Permeant Liquid Used:		Dealred Water		a. (cm²)	0.031416
He Equilibrium Leve	vel	1.990		Cell Pres	Cell Pressure (psi):	:	82.6	Ë	ack Pres	Back Pressure (oai):		80.0	<u> </u>	(cm²)	0.76743
Time (24-hr)	i Võis	Ten	peral	ire (°C)				Measurements	ements					K-Value	K-Value (cm/sec)
Start End Ti	Time Inl	# #	Final	Ave.	Factor	R <sub>p</sub> 1	Ra1	Rp2	Raz	Ξ	112	Initiel Gradient	Final Gradlent	Ü,	Corrected
1:32 1:33 (	╀		21.3	1	0.9683	4.80	1.90	4.40	1.80	37.7	31.4	4.78	3.99	1.34E-06	1 30F-08
1:41	_	21.3	-	21.3	7.9683	4.90	1.88	4.40	1.88	37.7	31.8	4.79	4	1 32F-08	1 28F-06
1:42 1:43	61 21	L.i	┡	1	0 8693	4 90	88	4 40	4 8	37 g	3	, a y	5	4 22C Ac	1 200
╫				-						3			7	1.555-00	1.285-00
		-				T		Ī							
	. 444														
		_													
		+	+												
	e e	+	+		$\dagger$										
		-	+	$\dagger$		1									
		1	+	-	†		1								
				1			T	1							
Notes: Permon	neter P7	Permometer P700000 by Trautwein Soll Testing was used for permeation	Trautwe	in Soll	estinow	as used		eation		446	dversoos.	480	4 00	4 32E AB	4 25 05
								4		1		Conducti	Conductivity vs. Time	7	20-30-1
Neteratives. ASTM D 5084: Measurement of Hwirarille Conductivity of Saturated Dominis	urement	of Hveira	nile Con	ductivíh	Safe	pted Da	<u> </u>		1.5E-06	ŀ	1				
Mat	terials U.	Materials Using a Flexible Wall Permeamater	exible W	all Perm	eameter		3	enje	1.05-06		\	•			
ASTM D 2216: Laboratory Defermination of Water (Moisture) Content	atory De	lerminat	ion of W	ater (Mc	Isture) C	ontent		K-V	5.05-07	_					
to	soll and l	of Soll and Rock by Mass	Mass						0.0E+00	\    -	200	907		000	
	٠.									•	•	5	Cumulative Time (sec.)		
Technician:		Karan Wamer	Mamer			ľ			1	1911/11/19					

Revision No. 0

# Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 X AASHTO T 89 П ASTM D 4318 AASHTO T 90 П Another code Quality Assurance S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 6/27/12 1356-11-032 Phase 03 Report Date: Project #: Marshall Industrial Landfill No. 1- Cells 3&4 Test Date(s) 6/20-27/12 Project Name: Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Sample #: CSL-1 Sample Date: 6/19/12 Boring #: NA Elevation: 0-6' Grid B3 Offset: NA Location: Orange Brown Clay w/Coarse to Fine Sand (CH) Sample Description: Type and Specification S&ME ID# Type and Specification S&ME ID# Cal Date: Cal Date: Balance (0.01 g) 6/25/2012 Grooving tool 20165 12/20/2011 3222 LL Apparatus 20230 6/26/2012 Grooving tool 10844 Grooving tool 5/9/2012 Oven Plastic Limit Pan# Liquid Limit Tare #: Cupid Ron Beta Bugs 111 Tare Weight 8.33 8.42 14.54 14.66 14.50 Α В Wet Soil Weight + A 17.95 18.83 24.77 21.09 20.80 Ċ Dry Soil Weight + A 14.46 14.91 20.80 19.56 19.32 1.53 1.48 Water Weight (B-C) 3.49 3.92 3.97 D 4.82 Dry Soil Weight (C-A) 6.13 6.49 6.26 4.90 E 30.7% % Moisture (D/E)\*100 56.9% 63.4% 31.2% 60.4% F 20 # OF DROPS 35 26 N Maisture Cantents determined by ASTM D 2216 T.T. LL = F \* FACTORAve. 31.0% Average One Point Liquid Limit 75.0 N Factor Factor 20 0.974 26 1.005 70.0 21 0.979 27 1.009 % Moisture Content 1.014 0.985 65.0 23 0.99 29 1.018 24 0.995 30 1.022 60.0 1.000 NP, Non-Plastic 55.0 Liquid Limit 61 Plastic Limit 31 50.0 30 Plastic Index 45.0 CH Group Symbol 100 15 20 35 40 25 30 # of Drops Multipoint Method 1 One-point Method Air Dried Wet Preparation Dry Preparation v 7 Estimate the % Retained on the #40 Sieve: Notes / Deviations / References: ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner 6/27/2012 Kyle Baucom Technician Name Date Technical Responsibility

# Form No. TR-D422-2

# Particle Size Analysis of Soils

**SWME** 

Revision No. 0

Revision Dote: 02/20/08

**ASTM D 422** 

S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273

 $K \times (L/T)^{1/2}$ 100.0% 100.0% 100.0% 0.01998 100.0% %0.00<sub>1</sub> 00.0% Diameter 0.01182 0.00845 0.00300 %6.66 %8.86 %8'.26 96.4% 93.5% 75.1% 0.04322 0.03103 0.00603 0.00125 87.4% Percent Passing Sodium Hexametaphosphate: 40 g./ Liter 3/25/2012 Soil Mortar 0.01320 (washed) 100.090.01320 76.0% Table 3 0.013200.01320 0.01320 0.01320 0.01320 0.01297 %6'86 %9.76 94.6% 88.4% Pan# Weathered & Friable × Call Date: Retained Wt. 152H 3ffective Depth 11.0 11.5 12.0 12.3 12.5 12.9 13.3 0.0 0.0 10.7 0.0 0.4 0.5 3.1 Sieve  $P \times \% Passing #10$ #100 #200 1/2" 1.0 3/4" :18/€ 01# #20 #40 09# # 8 P(total) =%6.79 63.9% 59.0% 52.0% 49.0% 46.0% 41.0% 36.0% 3901 Soft 151H Percent Passing 526 S. Church Street, Charlotte, NC 28202 Natural 2:700 2 6/19/12 ο<u>·</u>Ο  $(\mathbf{R}\mathbf{x}\mathbf{a}/\mathbf{W})\mathbf{x}100$  $DN_0$ × Apparent Relative Density (Assumed) Hygroscopic 68.7% 64.7% 29.6% 52.6% 49.5% 41.4% 46.5% 36.4% 2.11% 28.26 28.50 11.38 16.88 0.24 Hard & Durable Dispersion Time: Sample Date: Test Date(s): 6/20-27/12 Elevation: Hydrometer: Report Date: 6/27/12 Hydrometer % Moisture (100 x D/E) (C-A) Water Wt. (B-C) 34.00 26.00 29.50 24.50 20.50 18:00 32.00 23.00 Moisture Content Wet Wt. + A Dry Wt. + A Tare Wt. Tare# Dry Wt. × Composite Correction 6/25/2012 Sample Description: Orange Brown Clay w/Coarse to Fine Sand (CH) Angular Address: М Δ ₹ Ö ш Marshall Industrial Landfill No.1 - Cells 3 & 4 CSI-1 NA ASTM D 422, D 2487, D 4318 Cylinder Control Cal. Date: 5.0 5.0 5.0 5.0 5.0 5.0 5.0 Composite Correction 4.5 266.95 %8.86 272.51 50.00 272.51 48.97 0.99Offset: Sample #: Rounded Hydrometer Reading М 39.0 31.0 37.0 34.5 29.5 28.0 25.5 Beaker #: Fotal Sample Air Dried Wt. + tare wt. (grams): Weight of Air Dried Hydrometer Sample (g): 1356-11-032 Phase 03 3222  $\boxtimes$ Description of Sand & Gravel Particles Hydrometer Sample Oven Dried (W): Weight of Total Sample Air Dried: Duke Energy References / Comments / Deviations 21.5 Temp. (0.5 °C 21.5 21.5 21.5 21.5 21.5 21.5 23.0 Correction Factor a (Table 1): × Grid B3 'otal Sample Oven Dried: Pan Tare Weight (grams): NA Stirring Apparatus: Control Cylinder - Iydrometer Jar #: Project Name: % Passing #10: Client Name: Balance: (Min.) Time 1440 250 30 9 15 Project #: Boring #: Ŋ ocation:

S&ME, Inc. - Corporate

Raleigh, N.C. 27616

1356-11-032 03 CSL-1 Hydro.xls Page 1 of 1

Project Engineer

Position

3201 Spring Forest Rood

Technical Responsibility

Kyle Bancom

**NICET 117900** Certification #

Karen Warner

Technician Name

Revision No. 0

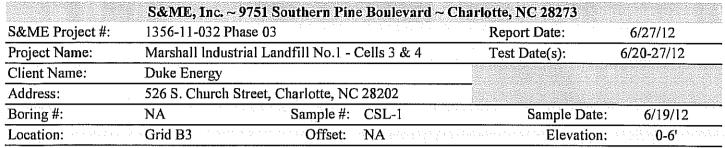
Revision Date: 02/20/08

# Particle Size Analysis of Soils



ASTM D422

Quality Assurance



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	, Silt	< 0.075 and > 0.005 mm
Coarse Sand	<4.75 mm and >2,00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	<0.001 mm

Maximum Particle Size: Gravel: 0.1% Silt 30.6% Silt & Clay (% Passing #200): 24.7% 75.1% Total Sand: Clay 44.5% 2.700 ent Relative Density (Assumed) Moisture Content Colloids 61 Liquid Limit Plastic Limit Plastic Index 31 30 Coarse Sand: 1.0% Medium Sand: 2.4% Fine Sand: 21.3% Description of Sand and Gravel Rounded 🗆 Hard & Durable Angular 🗵 × Soft Weathered & Friable Mechanical Stirring Apparatus A Dispersion Period: Dispersing Agent: 1 min. Sodium Hexametaphosphate: 40 g./ Liter References / Comments / Devigtions: ASTM D 4318, D 854, D 2487

Kyle Baucom

Technical Responsibility

Zy K.
Signature

Date: U/27//C

Project Engineer

7/2/1<sub>Z</sub> Date

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Technician Name:

Revision No. 0

Revision Dote: 11/21/07

# Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

	S&ME, Inc	.~ 9751 Soutl	hera Pine Bo	nlevard~Cha	rlotte, NC 282	273	
Project #: 13	356-11-032	en e	Phase	03	Report I	Date:	5/27/12
Project Name: M	larshall Industria	l Landfill No.	. 1 - CeIls 3 &	. 4	Test Da	te(s) 6/2	25-27/12
Client Name: D	uke Energy			•			
Client Address: 52	26 South Church	Street, Charle	otte, NC 2820	2			
Boring #: N	1 ing symptom sometimes	Sa	mple #:	CSL-1	Sample I	)ate: 6/	16/2012
Location: G					De	epth:	0-6'
Sample Description:							
Type and Specification		A CONTRACTOR OF STREET			ion S&		Cal Date:
Balance (0.1 g)	22182	Variable Addition School Section (Section School Section Secti	Carrier Control of the Control of th	paction Mold		20231	1/6/2012
Balance	22182	(Alembahan Marian Samungan Asberraf sporting)	AND THE PROPERTY OF THE PARTY O	paction Hamm	Milliam County (Co. 100 pt., Milliam County Co.	20222	6/6/2012
Straightedge	20124	wite the first of	/2012 Ove	Ω		10844	5/9/2012
Sieve	22100	The same and the same was a second	2012	11 - 11 - 11 - 11 - 11 - 11 - 11 - 11	::::	at it	
Water Content		nent requires C TO T265 □	JP Z Balance (C	1.1 gram Readal		Check:	4642 FI
ASTM D2216 ⊠	Water Added:	10 1263 L	600	ASTM D4959 660	480	ASTM D 420	Natural
	Tare #:	MAC	SR	18	JDM	420 AMRL 148	INALUIAI
A. Tare Weight	A.	161.8	163.7	157.4	159.5	161.9	
B. Wet Wt + Tare W	The state of the s	1188.5	1169.4	1177.8	1134.6	1160.6	
C. Dry Wt. + Tare W	5-5-5-5-5-5-5-5-5-5-5-5-5-5-5-5-5-5-5-	976.5	947.7	939.4	943.0	984.7	
	No. ment is different administrative financial of			<b>!</b>			
D. Water Weight	B-C	212.0	221.7	238.4	191.6	175.9	
E. Dry Weight	<b>C-A</b>	814.7	784.0	782.0	783.5	822.8	
F. Moisture Conten	95646460059560666	26.0%	28.3%	30.5%	24.5%	21.4%	
Compaction Data				gram or .0022 L		Check:	
ASTM D558	ASTM D 698		TM D1557 🗆	AASHTC	ALTO APPENDENCE OF THE PARTY OF		FO T180 □
Method A ⊠  G. Wt of Soil + Mol	Method B	5975	C □ 5997	5997	STM 1978) 🗆 5945	5843	) Method D∞ □ I
H. Wt. of Mold	4/00/4/00/04/05/04/05/05/05/05/05/05/05/05/05/05/05/05/05/		4241				1: 1 12
	H.	4241		4241	4241	4241	
1. Wt. of Soil (g. or 1	a unit about to aster the about the art of the art	1734	1756	1756	1704	1602	1
J. Wt of Soil (Lbs.)	ACTION AND AND ADDRESS OF THE ACTION ADDRESS OF THE ACTION AND ADDRESS OF THE ACTION ADDRESS OF THE ACTION AND ADDRESS OF THE ACTION ADDRESS OF THE	3.823	3.871	3.871	3.757	3.532	
K. Mold Volume Fa	history distance beginning	30.09	30.09	30.09	30.09	30.09	
L. Wet Density (PCF)	Description (Control of Control o	115.0	116.5	116.5	113.0	106.3	
M. Dry Density (PC	5/2006/98/98/98/98/99/99/99/99/99/99/99/99/99/	91.3	90.8	89.3	90.8	87.6	
Sieve Size used to separa Mechanical Rammer	te the Oversize Frac Manual 1		#4 Sieve	: ເ⊠ Moist Prep	3/8 inch Sieve aration □	☐ 3/4 Dry Prepa	l inch Sieve □ ration ⊠
References / Comments /			n not provided. N	VO = Not determi		and the second s	
					man Armana and a second		the state of the s
							· · · · · · · · · · · · · · · · · · ·
5000 <b>8</b> 00 5000		0		-			

Jennifer Olsen Technician Name

NICET / 117926

Certification Type/No.

6/27/2012 Date

Jennan 2 Olim Signature Kyle Baucom Technical Responsibility

Project Engineer Position

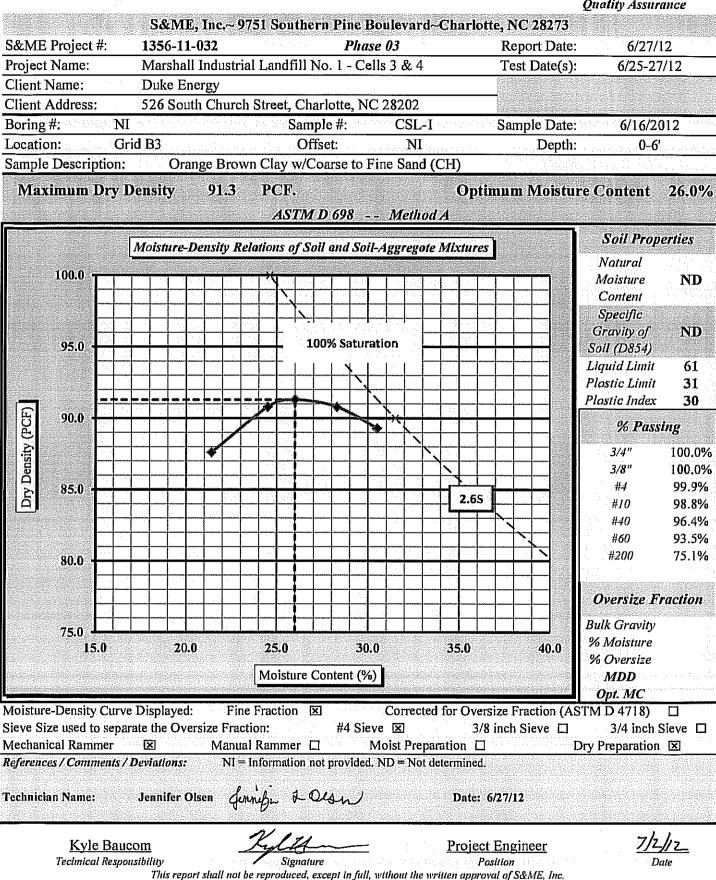
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Revision Date: 11/21/07

# Moisture - Density Report



Quality Assurance



### **CONSTANT HEAD PERMEABILITY** ASTM D5084 S&ME Project Number: 1356-11-032 Phase 03 Project Name: Marshall Industrial Landfill No. 1 - Cells 3 & 4 Sample Name: CSL-2 Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH) Type of Sample: Remoided Additonal Data Sample Data Molding Moisture Content Target Molding Conditon 22218 114.2 Panel No 7.267 Tare No. POT γ wet (pcf) Diam. (cm) 72.5 WWS+ Tare (gm) 91 Cell P (psi) Leng. (cm) 7.767 413.09 γ dry (pcf) 70.6 Area (cm²) 41.48 WDS+Tare (gm) 353.39 w (%) 25.5 Influent P (psi) Effluent P (psi) 70.0 Vol. (cm<sup>3</sup>) 322.15 WT of Water (gm) 59.7 Actual Molding Condition 112.7 WWS (gm) 581.7 WT of TARE (gm) 113.27 γ wet (pcf) 90.2 Gradient 5.0 WT Dry Soil (gm) 240.12 γ dry (pcf) w (%) 24.9 w (%) 24.9 $K = (Q \times L) / (t \times H \times A)$ Cell Burette (cc) Influent Burette(cc) Effluent Burette (cc) K(cm/sec) Temp. (°C) Hour Minute Second Time, t (sec) Q (cc) ∆ H (cm) Temp Corr. Run 12 7.3 1.0 2.9 46 7.3 2.9 1.0 1.9 38.7 1.0000 1.40E-06 20.4 13 12 6574 2.9 14 2 7.3 1.0 2 2.9 1.9 38.7 0.9530 1.34E-06 23 1.0 21.9 3 6561 7.4 20 7.4 1.0 2.9 3 3 4 38.7 0.9310 1.34E-06 2.9 0.9 2.0 22.7 4 53 30 6550 7.4 Ave. K (cm/sec) 1.36E-06 (Runs 1 thru 3) Ave. K (cm/sec) 1.36E-06

# **Particle Size Analysis of Soils**



Revision Date: 02/20/08

Project #:

1356-11-032 Phase 03

# ASTM D 422

S&ME, Inc. ~9751 Southern Pine Boulevard ~ Charlotte, NC 28273

Report Date: 8/10/12

											Liner Stockpile	*Compaeted Soil Liner Stockpile
								D 2487, D 4318	422, D 248	ASTM D 422,	ents / Deviations	References / Comments / Deviations
0.00131	0.01340	13.8	28.8%	28.	30.1%	00.51		5.0	0	20.0	21.5	1440
0.00311	0.01340	13.5	32.7%	32.	34.1%	17.00		5.0	0	22.0	21.5	250
0.00628	0.01340	13.2	36.5%	36.	38.1%	19.00		5.0	0	24.0	21.5	60
0.00877	0.01340	12.9	40 4%	40.	42.1%	21.00		5.0	0	26.0	21.5	30
0.01224	0.01340	12.5	44.2%	44.	46.2%	23.00		5.0	0	28.0	21.5	15
0.02079	0.01340	12.0	50.0%	50.	52.2%	26.00		5.0	0	31.0	21.5	5
0.03230	0.01340	11.6	54.8%	54.	57.2%	28.50		5.0	1,445	33.5	21.5	2
0.04487	0.01340	11.2	59.6%	59.	62.2%	31.00		5.0	0	36.0	21.5	
$K \times ((L/T)^{1/2}$	K		P x % Passing #10		(R x a / W) x 100	R	Correction	Cylinder (		Reading	(0.5 °C)	T (Min.)
D= C	Table 3	Depth	(al) =	P (total) =	P(-#10) =	Hydrometer	Composite	Control		Hydrometer	Temp.	Time
Diameter		Effective		Derrent Passing	_		ns.	Corrections				
	M	152H		151H	Type:			tion 🗆	site Correction	Composite	der 🗵	Control Cylinder
	3/25/2012	Cal. Date:	<u>o</u>	<i>lo.</i> 3901	neter: $IDNo$ .	Hydrometer:	6/25/2012		Cal. Date:	3222	ID No.	Balance:
T	Sodium Hexametaphosphate: 40 g./ Liter	ametaphosphat	odium Hex	1 min. So		Dispersion Time			В		aratus: A	Stirring Apparatus:
3	Friable 🗆 🗆	Weathered & Friable		Soft	Durable 🔲	J Hard & Durable	ılar [	☐ Angular	Rounded [		Description of Sand & Gravel Particles	Description of Sa
64.4%	67.3%	16.30	#200		1.33%	% Moisture (100 x D/E)	∿ Moisture	1.00	1 (		a (Table I):	Correction Factor a
79.2%	82.7%	8.62	#100		11.28	/t. (C-A)	Dry Wt.	8% E	95.8%			% Passing #10:
87.2%	91.1%	4.44	#60		0.15	Wt. (B-C)	Water Wt.	.84 D	49.84	( <b>W</b> ):	l	Hydrometer Sample Oven Dried
92.1%	96.2%	1.90	#40		28.17	Dry Wt. + A	****	.72 C	543.72		n Dried:	Total Sample Oven Dried
94.4%	98.5%	0.73	#20		28.32	Wet Wt. + A	3 14 5 5 1	.50 B	50.50	nple (g):	Weight of Air Dried Hydrometer Sample (g):	Weight of Air Dri
95.8%	100.0%	22.98	#10		16.89	Tare Wt.	<u> </u>	).64 A	550.64		ample Air Dried:	Weight of Total Sample Air Dried
96.7%	TOTAL	17.9	#4	ND		Tare #		).64	550.64	rt. (grams):	Total Sample Air Dried Wt. + tare wt. (grams):	Total Sample Air
98.0%	Coil Morton	10.6	3/8"	Natural	Hygroscopic	Moisture Content	Moisture				(grams):	Pan Tare Weight (grams):
98.3%		9.2	1/2"									Hydrometer Jar #
100.0%		0.0	3/4"	2.650	y (Assumed)	Apparent Relative Density (Assumed)	Apparent l			Beaker #:		Pan #:
100.0%	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.0	1.0"				lay (CH)	Red Tan Orange Medium to Fine Sandy Clay (CH)	dium to Fi	)range Me		Sample Description:
100.0%	_ (pedsewy)   ± ππυ	0.0	1.5"	NA	Elevation:	Elev		NA	Offset:		*See Below	Location:
100.0%	D-5 #	0.0	3.0"	7/19/12		Sample Date		: CSL-2	Sample #		NA	Boring #:
Passing	Percent Passing	Retained Wt.	Sieve	NC 28202	526 South Church Street, Charlotte, NC 28202	South Church S	ļ	Address			Duke Energy	Client Name:
					7/26-8/10/12	Test Date(s): 7/26	Test D	Cells 3&4	fill No.1 -	trial Landf	Marshall Industrial Landfill No.1 - Cells 3&4	Project Name:

S&ME, Inc. - Corporate

Jennifer Olsen/Karen Warner Technician Name

NICET 117900

Certification #

3201 Spring Forest Road Raleigh, N.C. 27616 Technical Responsibility

Kyle Baucom

Position Ďate

Project Engineer

8/15/17

Revision Date: 02/20/08

# Particle Size Analysis of Soils



ASTM D422

Quality Assurance

### S&ME, Inc. ~ 9751 Southern Pine Boulevard ~ Charlotte, NC 28273 S&ME Project #: 1356-11-032 Phase 03 Report Date: 8/10/12 Project Name: Marshall Industrial Landfill No.1 - Cells 3&4 Test Date(s): 7/26-8/10/12 Client Name: Duke Energy Address: 526 South Church Street, Charlotte, NC 28202 Boring #: NA Sample #: CSL-2 Sample Date: 7/19/12 Location: \*See Below Offset: NA Elevation: NΑ

Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH)

| 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100

Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	PARTY TO Silt Will SHEW SHE	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Particle Size (mm)

0.1

D C (C	, com r o						
Mechanical Stirring Apparatus A	Dispersion Per	iod: 1 min.	Dispersing A	gent; So	dium Hexa	umetaphosphate;	40 g./ Liter
Description of Sand and Gravel	Rounded 🗆	Angular 🗆	Hard & Dura	able 🗆	Soft	☐ Weathered	& Friable 🗆
Coarse Sand:	0.9%	Mediu	ım Sand:	3.7%		Fine Sand:	27.7%
Liquid Limit	52	Plas	tic Limit	28		Plastic Index	24
:nt Relative Density (Assumed)	2.650	Moisture	Content			Colloids	
Silt & Clay (% Passing #200):	64.4%	То	tal Sand:	32.3%		Clay	35.0%
Maximum Particle Size:	1/2"		Gravel:	3.3%		Silt	29.4%

References / Comments-(Deviations: ASTM D 4318, D 854, D 2487

Technician Name: Mululally Date: 8/14/17

Kyle Baucom
Technical Responsibility

ZyC ZZ Signature

Project Engineer

Position

B/15/12 Daie

0.001

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0.01

Revision No. 0

# Liquid Limit, Plastic Limit, and Plastic Index



Revision Date: 11/20/07 Another code ASTM D 4318 X AASHTO T 89 AASHTO T 90 **Quality Assurance** S&ME, Inc. ~9751 Southern Pine Boulevard, Charlotte, NC 28273 Project #: 1356-11-032 Phase 03 Report Date: 8/14/12 Project Name: Marshall Industrial Landfill No.1- Cells 3&4 7/20-8/14/12 Test Date(s) Client Name: **Duke Energy** Client Address: 526 South Church Street, Charlotte, NC 28202 Boring #: NA Sample #: CSL-2 Sample Date: 7/19/12 \*See Below Location: Offset: NA Elevation: NA Sample Description: Red Tan Orange Medium to Fine Sandy Clay (CH) Type and Specification S&ME ID# Cal Date: Type and Specification S&ME ID# Cal Dote: Balance (0.01 g) 3222 6/25/2012 Grooving tool 20165 12/20/2012 LL Apparatus 20230 6/26/2012 Grooving tool Oven 10844 5/9/2012 Grooving tool Pan# Liquid Limit Plastic Limit 2 Tare #: 39 L-10 P-2 41 57 Tare Weight 13.97 15.78 12.46 12.66 13.89 Α 15.82 В Wet Soil Weight + A 23.15 24.14 21.66 20.61 22.36 21.53 C Dry Soil Weight + A 20.12 21.33 18.47 17.79 20.94 19.88 D Water Weight (B-C) 3.03 3.19 2.81 2.82 1,42 1.65 E 5.99 Dry Soil Weight (C-A) 6.15 5.55 6.01 5.13 5.12 F % Moisture (D/E)\*100 49.3% 50.6% 53.1% 55.0% 27.7% 27.5% N # OF DROPS 33 29 23 19 Moisture Contents determined by ASTM D 2216 LL LL = F \* FACTORAve. Average 27.6% One Point Liquid Limit 65.0 Factor Factor 0.974 20 26 1.005 21 0.979 27 1.009 60.0 % Moisture Content 22 0.985 28 1.014 0.99 1.018 24 0.995 30 1.022 55.0 1.000 X NP. Noπ-Plastic Liquid Limit 52 50.0 Plastic Limit 28 Plastic Index 2.4 45.0 Group Symbol CH 10 100 15 20 25 30 35 40 # of Drops Multipoint Method [1 One-point Method Wet Preparation Dry Preparation 1 Air Dried 1 Estimate the % Retained on the #40 Sieve: Notes / Deviations / References: \*Compacted Soil Liner Stockpile ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils Karen Warner Kyle Baucom Technician Name Technical Responsibility This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

# Moisture - Density Relationship



ASTM D558, D698, D1557, AASHTO T99, T180

Quality Assurance

Project #: 135	6-11-032		Phase		Report I		8/14/12
	rshall Industria	l Landfill No.	. 1 - Cells 3 &	; 4	Test Da	ite(s)	7/26-28/12
	ke Energy						
	South Church		www.iv				
Boring #: NI			mple #:	CSL-2	Sample I	·····	7/19/2012
	See Comments		Offset:	NI		epth:	NI
Sample Description:	Red Tan S&ME II			indy Clay (CH		in continue in 18000000	ente de la companya
Type and Specification Balance (0.1 g)	=== 3&ME 11 22182			e and Specificat	회생 이용 사람이 없는 네 가 나쁜 가장 취임이	ME ID #	Cal Date:
Balance (0.1 g)	22182 22182	No vijeto		npaction Mold npaction Hamme	100 000 000 000 000 000 000 000	20231 20222	1/6/2012 6/6/2011
Straightedge	20124	and a construction of the constitution of	2011 Con 2012 Ove	<b>2</b> -2-1-2-1-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2	10-10-10-10-10-10-10-10-10-10-10-10-10-1	20222 10844	5/9/2012
Sieve #4	10939		2012	**		10011	J/J/2012
Water Conteut				).1 gram Readab	ility).	Check:	
ASTM D2216 ⊠		TO T265 🖂		ASTM D4959			I D4643 □
	Water Added:	180	120	60	As Is	240	
	Tare #:	PMB	- SQ-1	691	JRC	G	
A. Tare Weight	A.	162.3	159.1	156.3	156.2	157.2	
B. Wet Wt + Tare Wt	В.	1140.3	1159.7	1203.0	1078.5	1048.8	
C. Dry Wt. + Tare Wt	. C.	935.4	965.6	1018.8	932.7	847.5	······
D. Water Weight	B-C	204.9	194.1	184.2	145.8	201.3	
E. Dry Weight	C-A	773.1	806.5	862.5	776.5	690.3	
	1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -						1
and the second s	- 1.5% elling content of 1.5%	26.5%	24.1%	21.4%	18.8%	29.2%	
Compaction Data ASTM D558 ロ Method A 図	Requires a ASTM D 698 Method B	GP 5 Balance	for ASTM (1 g FM D1557 □ C □	gram or .0022 Ll AASHTO Method D (AS	o. readability). T99 🔲 TM 1978) 🗆	Check: AAS AASH	SHTO T180 TO Method D
Method A 国 G. Wt of Soil + Mold	Requires a ASTM D 698 Method B G.	GP 5 Balance   AS'  Method  6044	for ASTM (1 § ΓM D1557 □	gram or .0022 Li AASHTO	o readability). T99 🔲	Check: AAS	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold	Requires a ASTM D 698 Method B G. H.	GP 5 Balance	for ASTM (1 g FM D1557 □ C □	gram or .0022 Ll AASHTO Method D (AS	o. readability). T99 🔲 TM 1978) 🗆	Check: AAS AASH	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ⊠	Requires a ASTM D 698 Method B G. H. S.) G-H	GP 5 Balance   AS'  Method  6044	for ASTM (1 g FM D1557 □ C □ 6034	gram or .0022 Ll AASHTO Method D (AS	o. readability). T99 □ TM 1978) □ 5876	Check: AAS AASH 6013	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold  I. Wt. of Soil (g. or lbs	Requires a ASTM D 698 Method B G. H.	GP 5 Balance	for ASTM (1 g FM D1557   G  G  6034  4241	AASHTO Method D (AS 5979 4241	o. readability). T99 □ TM 1978) □ 5876 4241	Check: AASH 6013 4241	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data ASTM D558 口 Method A 国 G. Wt of Soil + Mold H. Wt. of Mold Wt. of Soil (g. or lbs) J. Wt of Soil (Lbs.)	Requires a ASTM D 698 Method B G. H. s.) G-H I/453.6 or I	GP 5 Balance	for ASTM (1 g rM D1557   G   6034 4241 1793	gram or .0022 Ll	o. readability). T99 □ TM 1978) □ 5876 4241 1635	Check:  AASH 6013 4241 1772	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold  Wt. of Soil (g. or lbs  Wt of Soil (Lbs.)  K. Mold Volume Factor	Requires a ASTM D 698 Method B G. H. S.) G-H I/453.6 or I	GP 5 Balance  ■ AS' ■ Method 6044 4241 1803 3.975	for ASTM (1 g IM D1557   C   6034  4241  1793  3.953	AASHTO Method D (AS 5979 4241 1738 3.832	o. readability). T99 □ STM 1978) □ 5876 4241 1635 3.604	Check: AASH 6013 4241 1772 3.907	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold  Wt. of Soil (g. or lbs)  Wt of Soil (Lbs.)  C. Mold Volume Facto  L. Wet Density (PCF)	Requires a ASTM D 698 Method B G. H. s.) G-H I/453.6 or I or K.	GP 5 Balance	for ASTM (1 g FM D1557	ram or .0022 Ll AASHTO Method D (AS 5979 4241 1738 3.832 30.09	5. readability).  T99	Check:  AASH 6013 4241 1772 3.907 30.09	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558   Method A   G. Wt of Soil + Mold  H. Wt. of Mold  I. Wt. of Soil (g. or lbs  J. Wt of Soil (Lbs.)  K. Mold Volume Facto  L. Wet Density (PCF)  M. Dry Density (PCF)	Requires a ASTM D 698 Method B G, H, s.) G-H 1/453.6 or I or K, J*K L/(1+F)	GP 5 Balance	for ASTM (1 g IM D1557   C	AASHTO Method D (AS 5979 4241 1738 3.832 30.09 115.3 95.0	D. readability). T99 □ STM 1978) □ 5876 4241 1635 3.604 30.09 108.4	Check: AASH 6013 4241 1772 3.907 30.09 117.6 91.0	없었다. [25] 이 전문(프라마스트스) (1) (1)
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold  Wt. of Soil (g. or lbs  Wt of Soil (Lbs.)  C. Mold Volume Facto  Wet Density (PCF)  M. Dry Density (PCF)  Sieve Size used to separate  Mechanical Rammer	Requires a ASTM D 698 Method B G. H. S.) G-H I/453.6 or I or K. J*K L/(1+F) the Oversize Fract	GP 5 Balance	for ASTM (1 g IM D1557   C	AASHTO Method D (AS 5979 4241 1738 3.832 30.09 115.3 95.0   Moist Prepa	D. readability). T99 □ TM 1978) □ 5876 4241 1635 3.604 30.09 108.4 91.2 3/8 inch Sieve ration □	Check:  AASH 6013 4241 1772 3.907 30.09 117.6 91.0	TO Method D
ASTM D558   Method A   G. Wt of Soil + Mold  H. Wt. of Mold  Wt. of Soil (g. or lbs  Wt of Soil (Lbs.)  C. Mold Volume Factor  Wet Density (PCF)  M. Dry Density (PCF)  Sieve Size used to separate Mechanical Rammer  References / Comments / Desire Astronomy	Requires a ASTM D 698 Method B G. H. s.) G-H 1/453.6 or I or K. J*K L/(1+F) the Oversize Fract Manual I Deviatious:	GP 5 Balance	for ASTM (1 g IM D1557   C	ram or .0022 Li  AASHTO  Method D (AS  5979  4241  1738  3.832  30.09  115.3  95.0	D. readability). T99 □ TM 1978) □ 5876 4241 1635 3.604 30.09 108.4 91.2 3/8 inch Sieve ration □	Check:  AASH 6013 4241 1772 3.907 30.09 117.6 91.0	TO Method D
Compaction Data  ASTM D558   Method A   G. Wt of Soil + Mold  H. Wt. of Mold  I. Wt. of Soil (g. or lbs  J. Wt of Soil (Lbs.)  K. Mold Volume Factor  L. Wet Density (PCF)  M. Dry Density (PCF)  Sieve Size used to separate  Mechanical Rammer  References / Comments / Density (PCF)	Requires a ASTM D 698 Method B G. H. s.) G-H 1/453.6 or I or K. J*K L/(1+F) the Oversize Fract Manual I Deviatious:	GP 5 Balance	for ASTM (1 g IM D1557   C	AASHTO Method D (AS 5979 4241 1738 3.832 30.09 115.3 95.0   Moist Prepa	D. readability). T99 □ TM 1978) □ 5876 4241 1635 3.604 30.09 108.4 91.2 3/8 inch Sieve ration □	Check:  AASH 6013 4241 1772 3.907 30.09 117.6 91.0	TO Method D
ASTM D558   Method A   G. Wt of Soil + Mold  H. Wt. of Mold  Wt. of Soil (g. or lbs)  Wt of Soil (Lbs.)  C. Mold Volume Factor  Wet Density (PCF)  M. Dry Density (PCF)  Sieve Size used to separate Mechanical Rammer  References / Comments / Density (PCF)	Requires a ASTM D 698 Method B G. H. s.) G-H 1/453.6 or I or K. J*K L/(1+F) the Oversize Fract Manual I Deviatious:	GP 5 Balance	for ASTM (1 g IM D1557   C	AASHTO Method D (AS 5979 4241 1738 3.832 30.09 115.3 95.0   Moist Prepa	D. readability). T99 □ TM 1978) □ 5876 4241 1635 3.604 30.09 108.4 91.2 3/8 inch Sieve ration □	Check:  AASH 6013 4241 1772 3.907 30.09 117.6 91.0	TO Method D
Compaction Data  ASTM D558 □  Method A ☒  G. Wt of Soil + Mold  H. Wt. of Mold  I. Wt. of Soil (g. or lbs  J. Wt of Soil (Lbs.)  K. Mold Volume Facto  L. Wet Density (PCF)  M. Dry Density (PCF)  Sieve Size used to separate	Requires a ASTM D 698 Method B G. H. S.) G-H 1/453.6 or I or K. J*K L/(1+F) the Oversize Fract Manual I Deviations: Date of Soil Liner	GP 5 Balance	for ASTM (1 g IM D1557   C	AASHTO Method D (AS 5979 4241 1738 3.832 30.09 115.3 95.0  Moist Prepa formation was not	D. readability). T99 □ TM 1978) □ 5876 4241 1635 3.604 30.09 108.4 91.2 3/8 inch Sieve ration □	Check:  AASH 6013 4241 1772 3.907 30.09 117.6 91.0	TO Method D

Revision No.: 0

Revision Date: 11/21/07

# Moisture - Density Report



Quality Assurance

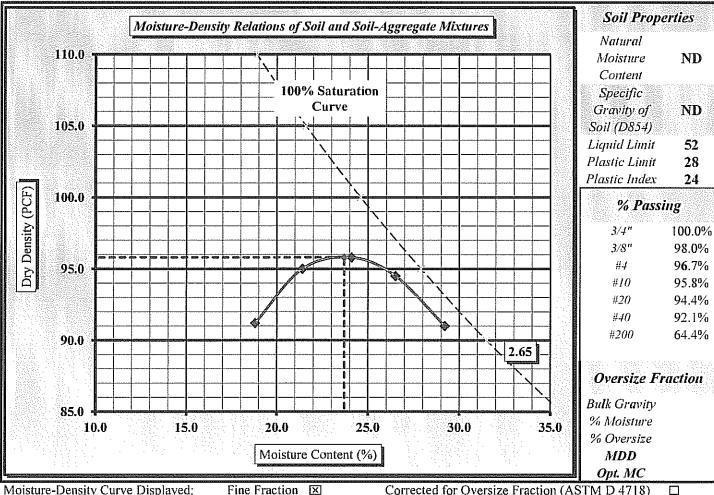
	S&ME, Inc. ~ 9751 S	Southern Pine I	Boulevard ~ Cha	arlotte, NC 28273	
S&ME Project #			ise 03	Report Date:	8/14/12
Project Name:	Marshall Industrial La	ındfill No. 1 - C	ells 3 & 4	Test Date(s):	7/26-28/12
Client Name:	Duke Energy				
Client Address:	526 South Church Stre	eet, Charlotte, N	IC 28202		
Boring #:	NI	Sample #:	CSL-2	Sample Date:	7/19/2012
Location:	**See Comments Below	Offset:	NI	Depth:	NI
Sample Descript	ion: Red Tan Orange	Medium to Fine	Sandy Clay (CH	)	

ASTM D 698 -- Method A

**Maximum Dry Density** 

PCF. 95.8

**Optimum Moisture Content** 



Fine Fraction 🗵 Moisture-Density Curve Displayed: Corrected for Oversize Fraction (ASTM D 4718) #4 Sieve 🗵 Sieve Size used to separate the Oversize Fraction: 3/8 inch Sieve □ 3/4 inch Sieve □ Mechanical Rammer  $\mathbf{X}$ Manual Rammer Moist Preparation □ Dry Preparation \*ND = Not determined \*NI = Information was not provided References / Comments / Deviations: \*\*Sample Location: Compacted Soil Liner Stockpile

ASTM D 2216; Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Kyle Baucom Technical Responsibility

Signature

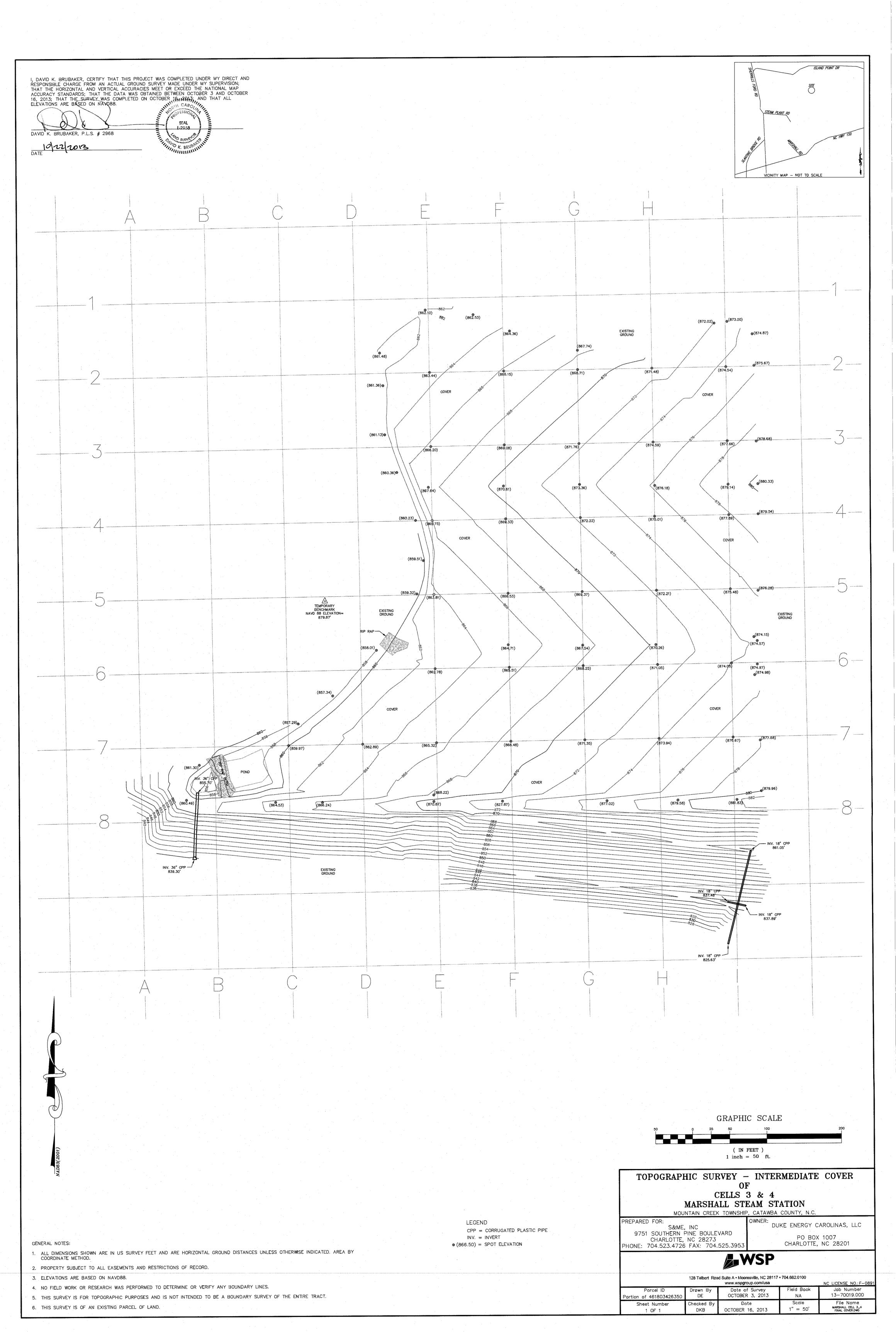
Position

This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

# APPENDIX I – EARTHWORKS Section 3 – Topsoil/Vegetative Soil Cover **Final Soil Cover As-Built Drawing Soil Cover Thickness Verification**

# **Final Soil Cover As-Built Drawing**





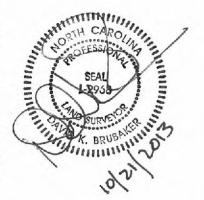
# **Soil Cover Thickness Verification**





# Marshall Cells 3 &4

STATION	TOP OF ASH	TOP OF COVER	DIFFERENCE
C-7	858.31	859.97	1.66
D-7	861.25	862.89	1.64
E-2	861.83	863.44	1.61
E-3	864.65	866.20	1.55
E-4	863.82	865.75	1.93
E-5	862.24	863.81	1.57
E-6	861.21	862.78	1.57
E-7	863.48	865.32	1.84
F-2	864.44	866.15	1.71
F-3	867.48	869.08	1.60
F-4	867.72	869.33	1.61
F-5	864.97	866.53	1.56
F-6	863.99	865.51	1.52
F-7	866.91	868.48	1.57
G-2	867.11	868.71	1.60
G-3	870.19	871.76	1.57
G-4	870.65	872.22	1.57
G-5	867.85	869.37	1.52
G-6	866.67	868.25	1.58
G-7	869.61	871.35	1.74
H-2	869.18	871.48	2.30
H-3	872.85	874.59	1.74
H-4	873.49	875.01	1.52
H-5	870.69	872.21	1.52
H-6	869.54	871.05	1.51
H-7	872.37	873.94	1.57
I-2	872.84	874.54	1.70 1.69
I-3	875.97	877.66	1.69
1-4	876.29	877.89	1.60
1-5	873.58	875.48	1.90
I-6	872.39	874.05	1.66
I-7	875.15	876.67	1.52



# APPENDIX II – PROJECT **DOCUMENTATION Section 1 – Construction Photographs Section 2 – Field Reports Section 3 – Issued for Construction Drawings Section 4 – Issued for Construction Specifications**

# APPENDIX II – PROJECT DOCUMENTATION Section 1 – Construction Photographs

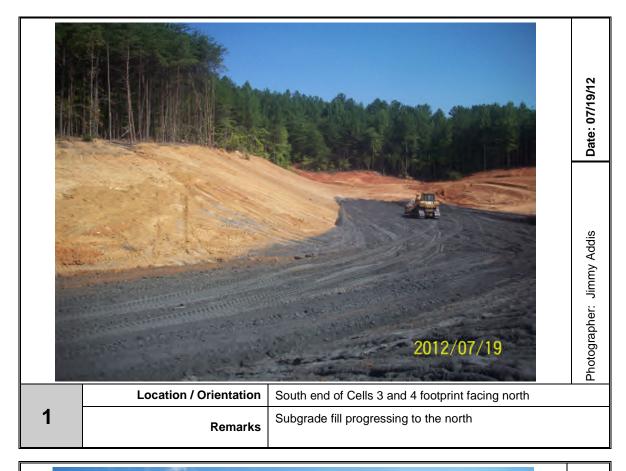


# Marshall Industrial Landfill No. 1 – Cells 3 & 4 Structural Fill Closure Report

Project #: 1356-11-032-06

Sheet 1 of 2





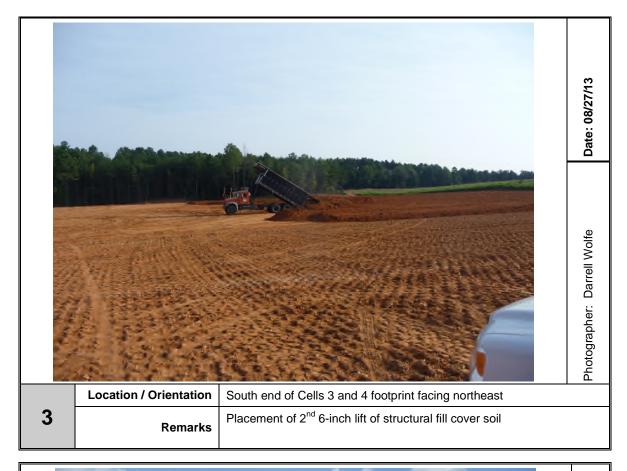


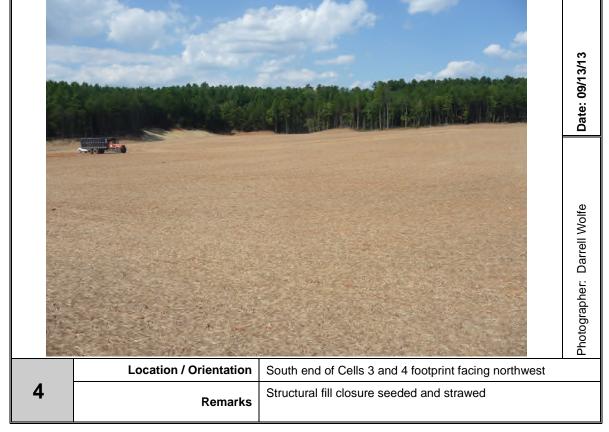
# Marshall Industrial Landfill No. 1 – Cells 3 & 4 Structural Fill Closure Report

Project #: 1356-11-032-06

Sheet 2 of 2







# APPENDIX II – PROJECT DOCUMENTATION Section 2 – Field Reports



46	<b>2ME</b>	9751 South Charlotte, N	ern Pine Blvd	Fiel	ld Report
		(704) 523-4 (704) 525-3	1726	May 3, 2017 Project/Location	
		Services	Performed	MSS Ind. LF	#1Cells 3:4
To: File		Cylinder Pickup	☐ Aspholt Coring ☐ Concrete Coring ☐ Undercut Evoluation	Southland 151	Weather/Temp EFA Sunny 1805
		Steel Testing	Foundation Evaluation Proofrolling In-Place Density	Present at Site Ronnie Puci	Kett - SEFA hew - Southland
				Jason May	new a South land
· • ·		Other (Exploin)		Time 5,0	Mileage පිට.

Observations/Remarks:

SEME rep. traveled to site arrivied at 10:30 gm.
Observed SEFA placing bottom ash on the future haul
road, that has been widered out to approximately 50
feet now. Contractor has placed a small area of structure
fill (flyash) on the South and of future cell 4. Not a big
enough area to test yet. I spake w/ Rannie who informed
me that the hand road should be completed whin the
next few days and then they would start concentrating
on flooring in available areas of cells 3 and 4.
Clearing and burning in progress. Spoke w/ Jason, said he
should be done w/ clearing by early next week. I
informed him that SEME would like to schedule test
Dits for sometime next week. Told Jason that Kyle Baycom
would contact him about setting up a time to do the TP's.
I took some pictures of existing conditions, left site @ 12:15
Lymner Addio
On-Site Representative/Company (5&ME Personnel
그 그는 그는 그를 가는 그는 기가 하는 것이 모든 그는 그를 가는 가게 되었다.

**Disclaimer:** The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. **The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.** 

Page \_\_\_ of \_\_\_



File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

**Asphalt Coring** 

Concrete Coring

6.0

Proofrolling In-Place Density

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

П

# FIELD REPORT Job No.: Date: 1356-11-032-Ph. 03 May 21,2012 Project/Location: MSS Ind. LF #1-Cells 3&4 Weather/Temperature: Contractor: SEFA/Southland Mostly sunny/70's **Undercut Evaluation** Present at Site: Foundation Evaluation Ronnie Puckett Time: Mileage:

80.0

# **Observations/Remarks:**

Technician onsite at 10:15 am. Observe SEFA placing structural fill (flyash) in future cell 4. Contractor utilizing a CAT D6 XLT dozer to spread flyash in approximately a one foot thick lift. Contractor running two 40 ton articulate dump trucks and Charrah hauling in with one tri-axle dump truck. Spoke with dozer operator (Alberto) informed him to keep lifts at a foot or less and do not cover any ash that has not been wet inplace. The material Charrah is hauling is very dry. Contractor is using their 25 ton articulate water truck for compaction, also spoke with the operator and asked if he was able to keep up with the structural fill wetting inplace and maintain haul roads. He said it was a lot to keep up with, but they have another smaller water truck to maintain haul roads when operators are available to run. I told him I would talk with Jerry if this becomes an issue, with the weather turning warmer in the coming months. I performed three field density test (shelby tube method). All test exceed required compaction and were within the moisture criteria. refer to attached data sheet. Informed contractor of test results. Southland started stripping topsoil on the North side of clearing area this am. Had to move some equipment this pm, no stripping done while I was still onsite. I left jobsite at 2:30 pm.

Jimmy Addis

## **On-Site Representative/Company**

### **S&ME Personnel**

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File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

8.0

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

n Pine Blvd.	FIELD REPORT			
28273 5	Date:		Job No.:	
53 fax	May 23,2012		1356-11-032-03	
	Project/Location:			
rformed	MSS Ind. LF #1-Cell	ls 3 &	4	
Asphalt Coring	Contractor:	We	ather/Temperature:	
Concrete Coring	SEFA/Southland Partly Cloudy/80's		tly Cloudy/80's	
Undercut Evaluation	Present at Site:			
Foundation Evaluation	Ronnie Puckett			
Proofrolling	Jerry Combs			
In-Place Density				
	Time:	Mile	eage:	

80.0

# **Observations/Remarks:**

S&ME technician onsite at 11:15 am. Observe subgrade prep by SEFA, flyash being placed in future cell 4. Contractor utilizing a 750 John Deere dozer to place flyash. Lift thickness is approximately 1 foot. Contractor has 2, 40 ton offroad dump trucks hauling in today. A 25 ton offroad water truck was wetting the flyash when I arrived and also rolling in the ash for compactive effort. I performed three field density test (shelby tube method) on inplace flyash. One of these test (#9) failed on moisture and compaction requirements. Informed Ronnie of test results and that failing material was the bottom fines that Charrah has been hauling in. I request that SEFA rework failing area for retest. Area was reworked and retest performed which passed. Refer to attached data sheet for test information. I told Ronnie I would mention to Kyle about the fines being used. Spoke with SEFA's dozer operator (Alberto) recommend that he spread these fines thinner. Other activity onsite today: Southland has 2 scrapers (Fiatallis) stripping in the area of test pits 7,8 & 10. This material is being hauled and stockpiled in the NE corner of cell 1. These areas appear to be cleaning up pretty good w/out stripping off a foot deep. I suggest to Ronnie to use his best judgement for strip depth (ie; don't waste good dirt), and relate this to the other operators. I left site @ 4:30 and returned to the office.

Jimmy Addis

## **On-Site Representative/Company**

### **S&ME Personnel**

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To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

n Pine Blvd.	FIELD REPORT			
28273 5	Date:		Job No.:	
53 fax	May 29, 2012		1356-11-032-03	
	Project/Location:			
rformed	MSS Ind. LF # 1-Cell	ls 3&₄	4	
Asphalt Coring	Contractor:	We	ather/Temperature:	
Concrete Coring	SEFA/Southland	Clo	udy- rain showers/80's	
Undercut Evaluation	Present at Site:			
Foundation Evaluation	Jason Mayhew			
Proofrolling	Ronnie Puckett			
In-Place Density				
	Time:	Mile	eage:	

80.0

## **Observations/Remarks:**

S&ME technician onsite at 10 am. Talk with Jason about job progress, was in the process of stripping on the North side of clearing area approximately between test pits 1 and 9. Southland is utilizing two Fiatallis scrapers and a CAT D6 dozer to strip. Strippings continue to be hauled and stockpiled in the NE corner of existing cell 1. Jason said he hopes to complete stripping this week. Jason to have stripping stockpile surveyed, hopefully next week.

6.0

Observe SEFA placing structural fill with/in future cell 4 area. SEFA utilizing a CAT D6XLT dozer to spread flyash. Observed lift thickness on the order of one foot being placed east to west. SEFA had two 40 ton offroad trucks hauling out of the silos today. Charrah also hauling in bottom fines from stockpile with one tri-axle dump truck. SEFA using their 25 ton water truck to wet and compact flyash. Rain showers slowed construction activity today. I was able to perform three field density test today on inplace flyash. All test passed required compaction and moisture criteria, refer to attached data sheet. Informed Ronnie of test results. Technician left site at 2pm.

Jimmy Addis

## **On-Site Representative/Company**

### **S&ME Personnel**

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<b>ACQME</b>	(704) 525-3953 fox		Field Report		
OCIVIL			Date June 1, 2012 Project/Location	Job No. 1356-11-032-03	
	Services	s Performed	MSS Ind. LF#1	Cells 3:4	
To: File	<ul> <li>□ Concrete Testing</li> <li>□ Cylinder Pickup</li> <li>□ Asphalt Testing</li> <li>□ Steel Testing</li> </ul>	Asphalt Coring Concrete Caring Undercut Evaluation Foundation Evaluation Proofrolling In-Place Density	Contractor	Weather/Temp  Mostly cloudy/81°	
	Other (Explain)		Time 7.0	Mileage 80.0	
Observations/Remarks:					
SEME technica					
structural fill (fly	iash) in f	uture cell 4	1. SEFA using a	CAT DGXLT	
dozer to spread f					
two 40ton offroa					
run one triaxle	dump tru	ack into ce	114 w/ bottom	fines. SEFA	
utilizing their 25					
and compact fill	materia	1. I perform	ned four field	I density test	
(fdt) today. All to	est excee	ed réquirec	d compaction	, and were	
wlin the moist	are crite	ria.Refer-	to attached.	fdt data	
sheet. Informed		The Artist Control of the Control of	and the second of the second o		
			cleared area	. on North	
side. Strippings				11 INNE	
corner. Technicia					
and a production of the state o	en de la companya de		en tenferen ir eta ili terrigi en ili tenin ili tenin eta eta. Esta en eta esperti esa entrepreta presenta pallogita en espe	and a singular tangga a sebiah singga ang atau ang tangga Apantan Arabah sangga atau ang atau at sangga at s	
	······································				

**On-Site Representative/Company** 

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Page 🔢 of 📗

COME	9751 Southern Pine Blv	d Field	Report
S&ME	Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax	Date June 4,2012	Job No. 1356-11-032-03
	Services Performed	Project/Location MSS Incl. LF#1	-cells 3:4
o: File	<ul> <li>□ Concrete Testing</li> <li>□ Aspholt Corin</li> <li>□ Cylinder Pickup</li> <li>□ Concrete Corin</li> <li>□ Aspholt Testing</li> <li>□ Undercut Evol</li> </ul>	ing SEFAlSouthkir	Weather/Temp Cloudy 1803
	<ul><li>☐ Steel Testing</li><li>☐ Proofrolling</li><li>☐ In-Place Densi</li></ul>	Konnie Pucke	
	Other (Explain)	Time 3.5	Mileage もの。
)bservations/Remarks:			
Technician &	onsite at 12:30.	SEFA placing 5	tructural
A1/	1 1 10 1)	<del> </del>	10t run
any field densi	7, 1001:110	ed up proctor	Sample Holand
#2'~56-2, and	vid on North	1 side "hallow"	w/ two
continues to states	1 2 11 1 4 1	NE corner and	stockpiled.
Left site at 2:1	5 pm.		
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	: · · · · ·		
		Zimmu Adde	<i>י</i> ትን
On-Site Representati	ve/Company	S&ME Pe	rsonnel

Discloimer: The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically outhorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.

COME	9751 Southern Pine Bl	vd	Field l	Report
S&ME	Charlotte, NC 28273 (704) 523-4726	Date		Job No.
	(704) 525-3953 fax	June	7.2012	1356-11-032-03
:		Project/Lo	catian	
	Services Performed	MSSI	nd, LF#1-	-Cells 3:4
: File	☐ Concrete Testing ☐ Aspholt Cor	ing <b>Cantracta</b>	r	Weather/Temp
: 1110	<ul> <li>□ Cylinder Pickup</li> <li>□ Concrete Concrete</li> <li>□ Aspholi Testing</li> <li>□ Undercut Ev</li> </ul>	oring South	nland i	PC/80's
	☐ Steel Testing ☐ Foundation	- Present a	t Site	
	☐ Proofrolling	Ronnie	e Puckett	
	☐ In-Place Der	Brad	Mayhew	
	Other (Exploin)	Time		Mileage
	Clay liner excavo	tion E	3,0	20,0
bservations/Remarks:				
Got a call fr	Com Jason Mayhe	w@8130 a	m this	morning. He
	1 to start exca			
	ner (CSL). I Sp		f	
confidence soil in	te. I got ousit	S CASTING	9:300	10 Southland
n process of exce	restura and Co	d in Augusti	the of it	pet 01+#8
1 Placess of Exco	2 COT 3200 Las	VI a a a a d	1 10 5	-la - a 2/a
omractor using	a CAT 330D trace	sac and	two gar	incem-ane
lump trucks. CSL				
South of Cells 3				2 of 4 to 6 tee
today. 80 loads s	tackpilled today.	Left site @	4:15 pm	
			e de la Contra de l La Contra de la Contra d	
			a a ta ta di	
			: '	
ting a varieties of the properties and a first of the properties of the properties and the properties of the p 			a varia et a et a e variat vez figure vaz geze	
		0 -	A 1	· Λ 2
		Jun	my Ho	ligo
On-Site Representati	ive/Company	$\cup$	5&ME Pers	onnel
sclaimer: The presence of S&ME of	the project site shall not be constru and has certain responsibilities whi	ed as an acceptance o	r approval of activ	vities at the site. S&ME is at the

project sile to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our lient. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.

CORAL	9751 Southern Pine Blvd	Field Report			
S&ME	Charlatte, NC 28273 (704) 523-4726	Date	Jab No.		
	(704) 525-4726 (704) 525-3953 fax	June 8, 2012	1356-11-032-03		
		Project/Location			
Ĭ	Services Performed	MSS IND. LF#/	-Cells 354		
prof. (	☐ Concrete Testing ☐ Asphalt Coring	Contractor	Weather/Temp		
: <u>File</u>	Cylinder Pickup Concrete Coring	Southland	Sunny /80's		
	Asphalt Testing Undercut Evoluation		1 -		
	☐ Steel Testing ☐ Foundation Evaluation ☐ Proofrolling	Present at Site  Brad Mayher			
_	☐ In Place Density		er e		
	Other (Explain)	Time	Mileage		
	Clay liner excavation	8,0	80.0		
	Clay liner excavation	1 0,0	1 00,0		
() (D)					
bservations/Remarks:					
			1-1-1-1-		
Onsite @ 9am. O	bserve Southland ex	cavating compe	icted soil liner		
naterial in vicinit	ty of test pit 8. O	ne tandem-a	rle dump		
ruck hauling too	ty of test pit 8. Of day ~ 50 loads stoce of 4 feet today. Le	Kpiled today.	Excavation		
102th on exposinge	of 4 foot today. Le	St 5170 @ 319	5517m		
1 Chap on according	, 3, 1,62, 1,23, 1,2				
	-				
·					
		Zjinny Ax	his		
On-Site Representat	ive/Company	Symmy AX	Au <sub>2</sub>		

project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.



	FIEL	D REPORT			
	Date:	Job No.:			
1	June 11,2012	1356-11-032-03			
in dia	Project/Location:				
	MSS Ind. LF # 1- Ce	ells 3 & 4			
	Contractor:	Weather/Temperature:			
	Southland	Cloudy/70's			
	Present at Site:				

		Services	Performed	MSS Ind. LF # 1- Cells 3 & 4		
		☐ Concrete Testing ☐ Cylinder Pickup	Asphalt Coring Concrete Coring	Contractor: Southland	Weather/Temperature: Cloudy/70's	
To:	File	Asphalt Testing	Undercut Evaluation	Present at Site:		
	<u> </u>	Steel Testing	Foundation Evaluation Proofrolling	Jesse		
		Other (Explain)	☐ In-Place Density	· ·	· ·	
		CSL excavation		Time:	Mileage:	
				5.0	80.0	

# Observations/Remarks:

#8. Used up soils i stockpiled today, c dress up around T	n this area today, whontractor only had o P-8 and get positive	hich were red/orange ne tandem-axle dum	e clayey np truck o will pre	silt, average depth whauling. Contractor to	ed soil liner material East of to vas 2 feet. A total of 28 loads o use the remainder of today North side and resume CSL	•
excavation tomore	ow weather permitti	ig. Tielt sile at T1.45	em.			
,						

Jimmy Addis

#### On-Site Representative/Company

### S&ME Personnel

AS&M	9751 South	ern Pine Blvd IC 28273	Field Report		
	(704) 523-4 (704) 525-3	726 953 fax	Dote  June 13, 2012	Job No. 1356-11-032-03	
		Performed	Project/Location MSS Ind. LF#1		
To: File	Concrete Testing C Cylinder Pickup Asphalt Testing	Concrete Coring	Southland	Weather/Temp Sunny 180's	
	Steel Testing	Foundation Evaluation Proofrolling	Present at Site Brad Mayhew		
	<u> </u>	In-Place Density	erika da Meka Perderika. Majar		
	Other (Exploin)		Time	Mileage	

7.0

80.0

CSL excavation

# Observations/Remarks:

I called Jason Mayhew, who is on vacation this week at 8:00 am this morning to inquire if his guys were working today. Jason said he thought they were not going to work, due to wet conditions from rain overnight. Got a call back from Jason around 9:30 am, said his guys were going to work, have been bladeing off mud and made new haul road. I got onsite at 11:30 am. Southland had hauled 7 loads out of test pit #1 area. The compacted soil liner (CSL) depth of excavation was only about 2 to 3 feet, report on test pit data list 6 feet in TP-1, I don't see it that deep. I had operator dig down from minus 3 to 6 feet below TP-1, and the soils go from tan to yellow brown to brown sandy micaceous silt. I called Kyle to discuss situation. Southland moved North of TP-1, CSL depth averageing 4 feet in this area. A total of 40 loads stockpiled today. Southland utilizing a CAT 320 trackhoe and two tandem-axee dump trucks, also John Deeve 750 dozen on stockpile. I left site at 5:30 pm.

On-Site Representative/Company

S&MF Personne

SS-ME	9751 Sou	thern Pine Blvd	Field	Report
JOHNE	Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax		Date	Job No.
			Tune 15 2012	1356-11-032-03
			Project/Location	
	Service	s Performed	MSSINd. LF#1	-Cells 3 = 4
To: File	· · · · · · · · · · · · · · · · · · ·	☐ Asphalt Coring	Contractor	Weather/Temp
	☐ Cylinder Pickup☐ Aspholt Testing	☐ Concrete Coring ☐ Undercut Evoluation	Southland/SEFA	Sunny-windy/803
	☐ Steel Testing	☐ Foundation Evaluation	Present at Site Bical Mayhew	
		☐ Proofrolling ☐ In-Ploce Density		
			Steve Faucett	도 발생으로 하는데, 기가 있다. 구글로그는 그리고 그리고 되었다.
	Other (Exploin)			A A A ST A ST A A A A A A A A A A A A A
	CSL exce		Time   8;0	Mileage &O, O
	LOOK ENG	ivallor	<u> </u>	80,0
Observations/Remarks				
SEME techni	cian onsi	te at 8:30 a	m. Observe S	southland
exceveting comp	acted so	sil liner in 1	vicinity of -	test pit 1.
Top foot of mat	erial is r	ied/orange	clayer silt:	1 to 3 At. is
orange clayey si	It below	134. 44	rns brown to	vellow brown
silt w/ some whi	to coloro	tion. Avera	ce death of	cut is 3 feet.
SEFA hauling	flyash fo	r Kubarade	construction	in Cell4
I van two field				
95% compaction, c				
Intermed Alber	to of the	turesults a	efecto catach	ed dete sheet
Southland el	م المالي	11 1000	the Thur. 14	the Allhou T
	1-11 -4 71	7-11-4		

**Disclaimer:** The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to thase specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. **The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.** 

**On-Site Representative/Company** 

FSKINL	Charlotte, NC 28273	I loiu.	richor i
UCIVIL	(704) 523-4726	Date	Job No.
	(704) 525-3953 fax		1356-11-032-03
<u></u>		Project/Location	
	Services Performed	MSS Ind. LF#1-	
To: File	☐ Concrete Testing ☐ Aspholt Coring ☐ Cylinder Pickup ☐ Concrete Coring	Contractor	Weather/Temp
	☐ Asphalt Testing ☐ Undercut Evaluation	Southland	Sunny-Hot/90's
	<ul><li>☐ Steel Testing</li><li>☐ Foundation Evaluation</li><li>☐ Proofrolling</li></ul>	Present at Site Brad Mayhew	en de la companya de La companya de la co
	☐ In-Place Density	Danny Cox	**************************************
		The production of the following the second s	
	Other (Exploin)	Time	Mileage
	CSL excavation	7.5	80.0
d.			
Observations/Remarks:			
	ian onsite at 9:30 a		
excavating compa	acted soil liner (CS	il) material s	south of TP-1
in grid B3. CSL (	cut was deeper to	day average	ing about
4 feet. Material	from 0 to 3ft. w	as orange br	own fine
_ sandy silty clay	~3 to 6ft. brown	1 orange sand	ly clavey silt.
Southland utili	zing a CAT 330 tra	ckhoé and to	wo tandem-
axle dump trucks	s. I picked up 1	oulk sample +	t6 and
transported to s	oils lab for testin	10. I left sit	e at 30m.
	stockpiled yesterday		
	The state of the s		
<del>e de la proposación de la completa de</del> La completa de la comp			
	And the second s	Quanta Add	1   Ma
On-5ite Representative	e/Company	S&ME Perso	ouuel ನ್
			taring na Alin na COAAT ( ) ()
	ne praject site shall nat be construed as an c ad has certain respansibilities which are lim		

client. In na event shall S&ME be respansible far the safety or the means and methods of other parties at the project site. The information

presented in this field report has not been reviewed by an engineer and is to be considered preliminary.

S&ME Form FRLF03



To:

File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

**Asphalt Coring** 

Concrete Coring

Proofrolling

In-Place Density

Concrete Testing

Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

### **FIELD REPORT** Job No.: Date: 06/25/12 1356-11-032-03 Project/Location: Marshall Industrial LF - Cells 3 & 4 / Terrell, NC Weather/Temperature: Contractor: Southland Sunny / 90s Excavating Present at Site: **Undercut Evaluation** Foundation Evaluation Jason Mayhew, Southland Excavating; Kyle Baucom, S&ME, Inc. Time: Mileage:

90

10:45 AM - 12:15

PM

## Observations/Remarks:

Arrived on-site at 10:45 AM. Met with Jason Mayhew with Southland Excavating. He explained that they had excavated approximately 5.000 to 6.000 cubic yards of future compacted soil liner material to date and approximately 6.000 cubic yards of topsoil that was stockpiled in Cell 1. Based on the existing grade and 2H:1V tie-in to the excavated grades, it appeared that approximately 3 to 4 feet of material had been excavated in the northern portion of the Cells 3 & 4 cleared area. I explained that a bulk sample from 4 to 7 feet deep was collected at Test Pit 9, and it classified as a ML material and resulted in a permeability of approximately 5 x 10^-6 cm/sec, which was less than the required 1x10^-5 cm/sec. I explained that similar material was also located at depths of 7 and 8 feet in Test Pits 1, 2, 3, and 4, and that as long as the material was consistent in this area with the test pits, then Southland could likely excavated another 3 to 4 feet in this area for compacted soil liner material. I also explained that they could excavate a little steeper than a 2H:1V to get some more material out of the slope. Jason explained that SEFA has left the southeast corner of the Cells 3 & 4 subgrade fill area open to maintain stormwater runoff. I explained that SEFA should not place in any of the excavation areas until the final survey and quantities are complete. I suggested that SEFA continue to place ash in the current location and possibly fill in the southeast corner towards the end of the excavation if they need additional area for ash placement. At approximately 11:30 AM. Jason Mayhew left the site. I continued riding around the area. The stockpile area was approximately 150 feet by 130 feet by 8 feet (or 5,800 cubic yards), which was close to Jason's estimate. I also drove to the southwest corner of the Cells 3 & 4 subgrade fill area and noticed that observation M-29 had not been abandoned. I also noticed that Southland had excavated approximately 3 to 4 feet in the area of Test Pit 8. I also noticed that there was no silt fence in place in the southwest corner as called out on the plans. Prior to leaving the site, I contacted Jason, and made him aware that Southland could excavate another 3 to 4 feet in the area of Test Pit 8 and that they should install silt fence in the area of the southwest corner. Before leaving the site, I drove to the area of the existing transmission line to be relocated with the construction of Cells 3 & 4. Left the site at approximately 12:15 PM.

Kyle Baucom

**On-Site Representative/Company** 

S&ME Personnel

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	<b>~</b>	\$1000.
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	Field Report						
	Date	Job No.					
.:	July 2, 2012 Project/Location	1356-11-032-03					
	Project/Location						
	MSSInd. 15#	FI- Cells 3 = 4					
14.14	Contractor	Weather/Temp					
	Southland	Sunny / 90's					

Mileage

80,0

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and the second control of the second control	the state of the s	
Services	s Performed	MSSINd. 15#
Cancrete Testing Cylinder Pickup Asphalt Testing Steel Testing	□ Asphalt Coring     □ Cancrete Coring     □ Undercut Evaluation     □ Foundation Evoluation     □ Praofralling     □ In-Place Density	Contractor Southland Present at Site Brad May her
Other (Explain) CSL exc	avation	Time 4.5

Observations/Remarks:

S	EME tech	nician of	1site at	10 am. 5	pouthland	was advised
						area again
and	Jeppen e	xcavation	1. 王 obs	erved co	mpacted s	oil liner
						o7foot cut
					s an ovar	
fine &	silt helon	w this 3 -	-07 feet	was lite	ovange t	o brown for
						sut by 3 to 4
					eft site @	
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						Marine Committee Com
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On-Site Representative/Company

\$&ME Personnel

ACQ-ME	9751 Southern Pine Blvd Charlotte, NC 28273	F'ield	Report
OCIVIL	(704) 523-4726	Date	Job No.
	(704) 525-3953 fax	July 5,2012	1356-11-032-03
: 			•
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Services Performed	MSS Ind. LF#	
To: File	☐ Concrete Testing ☐ Aspholt Coring ☐ Cylinder Pickup ☐ Concrete Coring	Contractor	Weather/Temp
	☐ Undercut Evaluation	SEFA /Southland	15unny/90s
<u> </u>	<ul><li>☐ Steel Testing</li><li>☐ Foundation Evaluation</li><li>☐ Proofrolling</li></ul>	Ronnie Pucket	Haraba Alaman
	In-Place Density	Brad Mayhew	
	Other (Explain)	Time	Mileage
· ·	CSL Excavation	7.0	80.0
Observations/Remarks:			
57ME technic	ian onsite at 10:15	am. Observe	SEFA placing
structural fill in tu	ture Cell 4-grid lin	<u>ec. SEFA util</u>	lizing a CAT
D6 dozer to place	flyash fill in appro	ximately 12 +	o 18 inch lift.
Two 40 ton office	d trucks hauling to	oday. A 40 tor	, offroad water
truck wetting fly	ash and rolling in	for compactin	re effort.
	density test on inpl		
95% compaction, an	d were whin the u	apisture crite	ria. Informed
contractor of test ve	esults, Picked up SG	-3 proctor san	nple a log into
soils lab.			
Observe Sau	thland excavating	compacted so	il liner (CSL)
		to 2' Red Ora	
13/1/ 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	e clayersilt 15 to	-/6	
	6. Two tandem-ax	the programme of the pr	
			ks nahling
CSL to stockpile	. area. I left jobs	ite at 3:15pm	
•			
	***************************************		
		,	<b>t</b>
	e de la companya del companya de la companya del companya de la co	Junny Addle	, Ф
On-Site Representative	e/Compony	S&ME Perso	onnel
Disclaimer: The presence of S&ME at the	e project site sholl not be construed as on a	acceptonce or approval of activ	ities at the site. S&MF is at the
project site to perform specific services on	d hos certain respansibilities which ore limi	ited to those specifically outhor	ized in our agreement with our
presented in this field report has no	nsible for the sofety ar the means ond met at been reviewed by an engineer on	noas or other porties at the pr ad is to be considered prel	oject site. The information iminary.

Page \_\_\_ of \_\_\_

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C O.RAE	1 9751 South	ern Pine Blvd	Field Report			
S&ME	Charlotte, N (704) 523-4 (704) 525-3	1726	July 9 20 Project/Location	Job No. 112   1356-11-032-0		
	Services	Performed		F#1-Cells 3:4		
to: File	☐ Aspholt Testing	☐ Concrete Coring ☐ Undercut Evolution	South and	Weather/Temp Sunny 1905		
	□ Steel Testing	☐ Foundation Evoluation ☐ Proofrolling ☐ In-Place Density	Jason May	hew		
	Other (Explain)		Time	Mileage		
	CSLexa	avation	6,0	්නිුු ර		
Observations/Remarks:						
SIME tec	MICIGA	ansite a	+9:45am	. Observe		
contractor prepa	The second commence of the com		and I have not been not all the same fine and one of	orani kana da kana ka kana ka kana ka a waka ka		
soil liner (CSL)	o'te 11	1 ^		requesting text		
from 0-3' Red		ge Brow	n Ckveu	Sit ~ 3-7'		
	dated s			construction		
	er Jason	to the contract of the contrac		ile to schedule		
surveyors this		A SAME OF A CONTRACT OF TAXABLE PARTY.	r utilizina	1		
trackhoe and	two tan	cem-axk	e dump to	ricks. I left		
site at 2.30pm						
	· · · · · · · · · · · · · · · · · · ·	:				
		s				
			Several programme and the several programme			
	en en la la la la ser l'alemana al page de	tug sang Pantatuna at at at an ana an an an an an an a				
	· · ·					
			2 June	Addio		
On-Site Representativ	/e/Company		S&ME)	Personnel		
Disclaimer: The presence of S&ME of the project site to perform specific services on the lient. In no event shall S&ME be response the properties of the pro	nd has certain respo onsible for the safety	onsibilities which ore lim y ar the meons and me	ited to those specifically thods of other porties at	outhorized in our agreement with a the project site. The information		

Page \_\_\_\_ of \_\_\_\_

		e almosta ne mones esca pe pr	<u>, a a a sur la partir de la republicación de la companya de la co</u>
\$S&MI	9751 Southern Pine Blvd Charlotte, NC 28273	Field	Report
	(704) 523-4726 (704) 525-3953 fax	July 12, 2012 Project/Location	Job No. 1356-11-032-03
	Services Performed	MSS Ind. LF#	1-Cells 3 & 4
To: File	<ul> <li>□ Cancrete Testing</li> <li>□ Cylinder Pickup</li> <li>□ Cancrete Coring</li> <li>□ Asphalt Testing</li> <li>□ Undercut Evaluation</li> </ul>	Contractor SEFA/Southland	Weather/Temp Cloudy 180's
	☐ Steel Testing ☐ Foundation Evaluation ☐ Proofralling ☐ In-Place Density	D	
	Other (Explain)	Time	Mileage
÷.	CSL excavation	7.0	0.08
Observations/Remarks		1 10 15 cm 10	ocanua Staca
	esentative onsite a	i joris ami. O:	USETUE SCA

SEME representative onsite at 10:15 am. Observe SEFA placing subgrade fill (flyash) in future Cell 4 agrids
B3 and B4. A CAT D6 spreading flyash in approximately one foot thick lift, tracking in as placed. A volva 40 ton offroad truck wetting and volling in flyash behind the dozer operation. I performed two field density test (fdt) today (#123-24) in grids B3 and B4. Both fdt's passed required compaction and were whin the moisture criteria. Informed contractor of test results. No subgrade fill placed this afternoon.

Monitur Southland excavating compacted soil liner material out of the Southwest area (TP-8 vicinity). Area excavated previously, but Kyle Baucam recommended this week to go over area one more time. Depth of aut was 4ft. (+1-) D-2' Orange Brown Si ~ 2-4' white Tan Yellow Si. Rough estimate of CSL stockpile: N half 105x225x9=7875
Pik-Lip sample SG-4, left site & 4:30. S half 105x225x14=12,250
20,125<

On-Site Representative/Company

5&ME Personnel

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Page \_\_\_\_ of \_\_\_

<b>\$S&amp;ME</b>	9751 Southern Pine B Charlotte, NC 28273	Slvd R	ield Report
OCIVIL	(704) 523-4726 (704) 525-3953 fax	Dote July 19	2012 1356-11-032-03
	Services Performe		F#1-Cells 3:4
To: <u>File</u>	Concrete Testing Aspholt Concrete Cultivation Cylinder Pickup Concrete Conc	SEFA/SOL Valuation Present of Site	Holand Sunny 120's
	☐ Proofrolling☐ In-Place De	Jason N	layhew
	Other (Explain)	Time 4.0	Mileage
Observations/Remarks:			
	presentative c	insite at 10	am.Observe
SEFA Plooring in	My Subgrac	le on gric	B-1 and 2.
started in this	area on we	duesday, how	refully this grea
was surveyed.	I did not 14	n any comi	action test.
Southland in to	he process of	dressing u	p the compacted
soil liner stack	pile they plan	1 on seedii	
Southland reshap	ed the big 5	lope where	-compacted
soil liner was	borrowedu	between tes	+ pits 5 to9.
tan kanan kana Kanan kanan ka			
	<u> </u>	10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	
			•
en e		Jemme	Addia
On-Site Representati	ve/Company	<b>○ 5&amp;</b>	ME Personnel

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Barra I at I



To: File

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Penformed

Proofrolling In-Place Density

Cancrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

n Pine Blvd 28273	Field Report			
26	Date	Job No.		
53 fax	July 23, 2012	1356-11-032-03		
	Project/Location	,		
enformmerd .	MSS Ind. LF#1	-Cells 3:4		
Asphalt Coring	Contractor	Weather/Temp		
Concrete Coring Undercut Evaluation	SEFA	Sunny /70-90's		
Foundation Evaluation	Present at Site			
Proofrolling	Ronnie Puckett			
In-Place Density	Alberto			
	Time	Mileage		

7.0

0.08

Observa	tions	/Remar	•ارح•
ODBOLVA	ハハガバの/	'INCILLAI	·CA

<b>\</b>
SIME representative onsite at 10 am. Observe contracto
placing subgrade fill (flyash) in Cells 3 = 4. Contractor
utilizing a CAT D6 dozer to spread fill. A volvo offroad
water truck observed wetting fill inplace and rolling
in for compactive effort. I performed four field density
test today. All test exceeded 95% compaction, and met
moisture requirements. Refer to attached data sheet. Inform
contractor of test results. Southland has not done any
contractor of test results. Southland has not done any seeding as of yet. Left site at 3pm.
On-Site Representative/Company S&ME Personnel



Field	Report
Date	Job No.
	1356-11-032-03
Project/Location	ć

				Project/Location	,
		Service	s Pentonned	MSSINd. LF#1	-Cells 3×4
To:	File	☐ Concrete Testing	-	Contractor	Weather/Temp
10		Cylinder Pickup  Asphalt Testing	Concrete Caring Undercut Evaluation	SEFA	Cloudy 180's
-		Steel Testing	Foundation Evaluation	Present at Site	
-			☐ Proofrolling		
_			☐ In-Place Density		
_					
_		Other (Explain)	<u> </u>	Time	Mileage
_		P'4D Drac	tor sample	3.0	£ 80.0
Obs	servations/Remarks:				
	Pickup sample	e af flyas	5h n SG-5	SEFA not he	ulius into
CE	Pickup sample 1115 3 4 today.				311113
	311 3 1 1 1 0 Culy a				
-					
<del></del>		· · · · · · · · · · · · · · · · · · ·			
			-		
					, 4
				Juney Ad	dia
	On-Site Representation	ve/Company		U SEME Pers	onnel



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Date Job No.

1350-11-032-03

	Services	s P	enformed	MSS: Ind.	LF#1.	-Cells	354
	Cancrete Testing		Asphalt Caring	Contractor		Weather/	Temp
]-	Cylinder Pickup	0	Concrete Coring	CILA		ا در در د	1/00
	Asphalt Testing		Undercut Evaluation	ンロノ		DUNNY	1/2005

Present at Site
Proofrolling

Present at Site
Ronnie Puckett Steel Testing ☐ In-Place Density

Time Other (Explain) Mileage 5.5 80.0

# Observations/Remarks:

į	
SIME technician onsite at 9	130 am. Observe contractor
placing subgrade fill (flyash) in	
DG XLT dozer was spreading as	Hin approximately I foot
thick lift, 3 - 40 ton officed +	rucks hauling today,
Contractor utilizing a 40 ton of	froad water truck to
wet and compact, as well as v	naintain the inplace fill
and haul roads. I performed th	ree field density test, all
test exceed 95% compaction, and	d all met maisture
requirements. Inform contractor	of test results. Leave
site at 1pm.	
į	
	~ / · · · · · ·
	Jammy Articles
On-Site Representative/Company	Same Personnel

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Page \ of \

\$S&MI				Date Aug. 15, 2 Project/Location	Carry .	Report Job No. 1356-11-032-03
To: File	0000	Service: Concrete Testing Cylinder Pickup Asphalt Testing Steel Testing	S Performed  Asphalt Coring Concrete Caring Undercut Evaluation Foundation Evaluation Proofrolling In-Place Density	Contractor SEFA		Cells 3 = 4 Weather/Temp Cloudy 180's
	0	Other (Explain)		Time 5,5		Mileage
placing subgrade utilizing of CAT offroad dump bottom fines to being used to and haul road test exceed 95	to co	fill (fl 26 XLT 4cKs he Lay. A ! Sumpact Lay. A ! Sumpact Compact	yash) in g dozer to duling tod Sucception wet, and ormed two stion, and	rids D3 o spread w ay Chara offroad maintai field dev fell whi	and material was	rial, 3 40ton not hauling ter truck abgrade fill test both
moisture contents site of 1:45.	nt.	Infan	med Alber	10 of 163	t re	sults. Left

**On-Site Representative/Company** 

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S&ME Personnel



To:

File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

Site Visit

n Pine Blvd.	FIELD	R	EPORT
28273 S	Date:		Job No.:
, 53 fax	09/07/12		1356-11-032-03
	Project/Location:		
rformed	Marshall Industrial LF	= #1 -	Cells 3 & 4 / Terrell, NC
Asphalt Coring	Contractor:	We	ather/Temperature:
Concrete Coring	Southland Excavating, SEFA	Sur	nny / 90s
Undercut Evaluation	Present at Site:		
Foundation Evaluation	Kyle Baucom, S&ME	, Inc.	
Proofrolling	, , , , , , , , , , , , , , , , , , , ,	, -	
In-Place Density			
	Time:	Mile	eage:

80

11:00 AM - 1:00

PM

## Observations/Remarks:

Arrived on-site at 11:00 AM. Walked the subgrade preparation area to look at erosion and sediment control measures. The existing silt fence and silt fence outlet on the west end of the area were full of sediment. Additionally, silt fence should be installed at the downstream end of the area cleared for down drain installation. The future compacted soil liner stock had little to no vegetation established resulting in rilling on the slopes and the silt fence to the south being full of sediment. Additionally, there was an erosion rill at the northwest corner of the stockpile area that resulted in a soil/ash sediment mixture in the existing channel west of the stockpile. These areas with excess sediment should be cleaned out and the erosion control measures should be repaired, if necessary.

SEFA was placing ash as subgrade in Grid C1. They were utilizing 2 Volvo A40D trucks and a dozer to transport, dump, spread, and compact the ash in place. Collected sample SG-7 for CQA laboratory testing. There was also an approximate 15-foot high slope on the south end of the subgrade fill area. This slope should be covered with 12 inches of soil cover (per .1700 structural fill rules) as SEFA works their way up with subgrade fill placement. I explained this to Robb Erwin when we met at Cell 1 and 2.

Observed and recorded total leachate pumped, pumping rates, and sump liquid levels in Cell 1 and 2. The Cell 2 LCS high flow pump did not pump when placed in manual pumping mode. However, the liquid level in the sump was approximately 13.6", which is less than the run-start liquid level of 46" for the high flow pump. This pump should be observed in the future to verify that it pumps at higher liquid levels.

Kyle Baucom

**On-Site Representative/Company** 

**S&ME Personnel** 

V		

Field	l Report	
	Job No.	

OCIVIL	(704) 523-4 (704) 525-3	953 fax	Date Sept. 13, 2012	Job No. 1356-11-032-03
	Services		Project/Location MSSInd. LF#1	-Cells 3 4
To: <u>File</u>	Concrete Testing  Cylinder Pickup  Asphalt Testing	Concrete Coring	Contractor SEFA	Weather/Temp Sunny 180's
	Steel Testing		Present at Site	
	Other (Explain)		Time	Mileage

Observations/Remarks:

0 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	11 1 7
Unsite at 10:30. SEFA done 1	rauling for the day. The water
truck was wetting and rolling i	n the subgrade. I request that
he wet and roll material previous	asly placed so I could test I
performed five field density to	st (#'s 36-40), all test exceeded
95% connection and met the	moisture criteric Picked up
performed five field density to 95% compaction, and met the bulk sample SG8, log into lab.	Left site of 3:30.
	· · · · · · · · · · · · · · · · · · ·
·	·····
	·····
	······································
	0' 41'
	Junny Addres
On-Site Representative/Company	S&ME Personnel

S	&	N	E
J	U		

To: KC

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

nern Pine Blvd	Field	l Report
NC 28273		
4726	Date	Job No.
3953 fax	9-11-12	1356-11-016
	Project/Location	<b>0</b> *
Performed	MANSAMICS	s landfill
Aspholt Coring	Contractor	Weather/Temp
<ul><li>Concrete Coring</li><li>Undercut Evaluation</li></ul>		Sunny To's
☐ Foundation Evaluation	Present at Site	
Proofrolling	LAM	Same
In-Place Density	JA: m	Sont Heard Excapating
	Time Annual 10.	aa Milegge
	L. DEPRARUM 12.	70 /800
V		
led Jemm	y in lower	hing coal
Anshall 550	I am to dis	truck.
acti de	de la companya della companya della companya de la companya della	

Observations/Remarks:
Some personnel asserted finning in loading coal
(do be descended at Mansall 55) on to his truck.
Same personnel on sete to familiaring himself with
location of landfill rell 3+ 4 and to perform
to is on fill placed and comparted a cell
3+4. No Post were performed Joday. Trucks
worling on bottom ash placement
j
·

**On-Site Representative/Company** 

**S&ME Personnel** 

S	<b>R-I</b>	M	
7		V	

Date

Field l	Report
	Job No.

•	(704) 525-	3953 fax	Sept. 17,2012	1356-11-032-03	
			Project/Location	1	
	Services	s Performed	MSS Ind. LF#1-	·Cells 3 = 4	
To: File	☐ Cancrete Testing	Asphalt Coring	Contractor	Weather/Temp	
10.	<ul><li>Cylinder Pickup</li><li>Asphalt Testing</li></ul>	<ul><li>Concrete Coring</li><li>Undercut Evaluation</li></ul>	SEFA	Cloudy/Rain/70's	
	Steel Testing	Foundation Evaluation Proofrolling In-Place Density	Present at Site Rounie Pucket	•	
			Time	AA:	
	Other (Exploin)			Mileage	
			3.0	80.0	
Called Ronnie	Observations/Remarks:  Called Ronnie to see if they were hauling, left him a				
voicemail. Travel to site, arrive at 10:45. SEFA hauling					
subgrade fill (flyash), trying to fill in low area (app. D2)					
where alot of b	pottom fi	nes were	dumped by	Charah last	
week. Mixing fl	lyash bei	ing hanled	in today w/	the bottom	
fines. Have not	covered	Greas I	test on 9/13/17	2. Left site	
at 11:45.					
				,	

**On-Site Representative/Company** 

SP. ME Porsonn



To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

X

7.0

Concrete Testing

Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

n Pine Blvd.	FIELD REPORT		
28273	Date:		Job No.:
53 fax	Sept. 21, 2012		1356-11-032-03
	Project/Location:		
rformed	MSS Ind. LF #1-Cell	s 3&4	,
Asphalt Coring	Contractor: Weather/Temperat		ather/Temperature:
Concrete Coring	SEFA	Sun	iny/70's
Undercut Evaluation	Present at Site:		
Foundation Evaluation	Alberto		
Proofrolling			
In-Place Density			
	Time:	Wile	eage:

80.0

Jimmy Addis

**S&ME Personnel** 

# Observations/Remarks:

S&ME representative onsite at 9:30. Observe contractor placing subgrade fill (flyash) on D line. Contractor utilizing a CAT D6T dozer to spread fill, and a CAT 40 ton articulate water truck to wet and compact fill. I performed 5 fdt's today, had 1 failing test (low moisture) other fdt's all passed. Recommended that non-compliance test area be reworked for retest which passed. Inform contractor of test results, refer to attached data sheet. Pick up proctor sample SG-9, log into lab. Called Ronnie Puckett to discuss erosion control issues which need to be addressed, Jason Mayhew not onsite. Left jobsite at 2:30.

On-Site Representative/Company

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Page 1 of



To:

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

6.0

Concrete Testing

Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

n Pine Blvd.	FIELD REPORT					
28273	Date:		Job No.:			
, 53 fax	Sept. 25, 2012		1356-11-032-03			
	Project/Location:					
rformed	MSS Ind. LF #1- Cells 3&4 Subgrade Prep.					
Asphalt Coring	Contractor:	We	ather/Temperature:			
Concrete Coring	Southland	Sur	nny/70's			
Undercut Evaluation	Present at Site:					
Foundation Evaluation	Jason Mayhew					
Proofrolling	Jerry Combs/Ronnie Puckett					
In-Place Density						
,	Time:	Mile	eage:			

80.0

# Observations/Remarks:

S&ME representative onsite at 10am. Observe that SEFA was not working/hauling into Cells 3&4 today. Spoke with Jerry and Ronnie and ask them to cover the South slope of the subgrade fill with soil and stabilize. This will aid in the erosion control of the flyash as per Kyle Baucom's request. Southland had Plastic Fusion (PFF) onsite today. PFF fused 42 inch SDR 32.5 solid wall HDPE pipe today. Four 50 foot joints welded together for Downdrain #2. Southland did not center pipeline as of yet, only weld inplace thus far. Talk with Jason about mucking out silt fence outlet area, and of constructing soil berm across this area. Southland has some grading to perform upstream of downdrain #2 to make it work. Southland also reseeded the compacted soil liner stockpile today. Took pictures and left site at 2pm.

On-Site Representative/Company

Jimmy Addis **S&ME Personnel** 

S	&	V	
		I W	

	Fiel	ld ]	Rep	ort
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UCIVIL	(704) 523-	4726	Date	Job No.
<b>V</b>	(704) 525-		Sept. 28.2012	1356-11-032-03
			Project/Location	ί,
	Services	s Performed	MSS Ind. LF-G	
ro: File	Concrete Testing		Contractor	Weather/Temp
10. 4.1	<ul><li>Cylinder Pickup</li><li>Asphalt Testing</li></ul>	<ul><li>☐ Concrete Coring</li><li>☐ Undercut Evaluation</li></ul>	SEFA	Sunny/803
-	Steel Testing	☐ Foundation Evaluation	Present at Site	
		Proofrolling In-Place Density	Alberto	
		ы эп-гіасе Density		
				In and
	☐ Other (Explain)		Time	Mileage
to realize the selection of the selectio			6.0	80.0
Observations/Remarks:	•			
Onsite at	9:45 Cam	. Observe	contractor pl	9619
1 1 1 1 1 1	4	le prep. in	2101 0	actor utilizing
a CAT DGT dozer	. 1	11 1	1201	SFFA STILLING
	, 7 1	1 7 /		0 Dille 1 11.
operator continu		1 1 -9	existing slop	1 V 1
Hyash and soil, i		request. Fo	rty ton office	ogd water
ASI 1 / /	1 0 1	acting till	today, 9130	maintaining
fill and haul road	ds tor o	ust contro	1 (11) 11( 1	e field
	by tube u		day (#3 46-48	1), all test
exceed 95% comp	raction, c	and were w	lin the mois	sture criteria.
Inform Alberto	of test	4 4	save site at	2pm_
		g not onsi	1	4
0-17. 110h 10 C	, · · · · · ·	J *** 3101		
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			() free Add	Bn
On-Site Representat	ive/Company		S&ME Pers	°)′ onnel
on one representati	,pairy			~



To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

 $\boxtimes$ 

Time:

7.0

Concrete Testing

Cylinder Pickup

**Asphalt Testing** 

Other (Explain)

Steel Testing

ı Pine Blvd.	FIELD REPORT						
28273	Date:		Job No.:				
, 53 fax	Oct. 3, 2012	1356-11-032-03					
	Project/Location:						
rformed	MSS Ind. LF # 1-Cells 3&4						
Asphalt Coring	Contractor:	Weather/Temperature					
Concrete Coring	SEFA	Par	tly Cloudy/70"s				
Undercut Evaluation	Present at Site:						
Foundation Evaluation	Ronnie Puckett						
Proofrolling							
In-Place Density							

Mileage:

80.0

# Observations/Remarks:

S&ME representative onsite at 9:55 am. Observe SEFA placing structural fill for subgrade preparation in Cell 4. SEFA utilizing a CAT D6T dozer to spread flyash, lifts approximately one foot thick. A 40 ton offroad water truck being used to wet and compact the flyash and control dust. I performed four field density test (shelby tube method) today. All test exceed 95% compaction, and were w/in the moisture criteria of +/- 3% of optimum. Inform SEFA of test results. Speak with Ronnie about erosion control, since Southland was not onsite. None of the issues discussed last week have been addressed. Site had 2 inches of rainfall this past Monday/Tuesday. Ronnie to talk with Southland about significance of installing E&SC features, and will assist if need be. I left jobsite at 3:30pm.

On-Site Representative/Company

Jimmy Addis **S&ME Personnel** 

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Page 1 of



9751 Southern Pine Blvd.

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		-	•7	$\frown$		
	1		-4			

	ENGINEERING •	(704) 523-4726		<b>Date:</b> Oct. 8,2012	<b>Job No.:</b> 1356-11-032-03		
	ENVIRONIVIENTALS	EKVI	CES ( )			Project/Location:	
			Services	Pe	erformed	MSS Ind. LF #1-Cell	s 3&4
			Concrete Testing		Asphalt Coring	Contractor:	Weather/Temperature:
			Cylinder Pickup		Concrete Coring	SEFA	Cloudy-Misty/60's
To:	File		Asphalt Testing		Undercut Evaluation	Present at Site:	
-			Steel Testing		Foundation Evaluation	Ronnie Puckett	
_					Proofrolling		
-				$\boxtimes$	In-Place Density		
-			Other (Explain)				
-	MANAGEMENT OF THE PARTY OF THE					Time:	Mileage:
-						7.0	80.0

### Observations/Remarks:

S&ME representative traveled to site, arriving at 10:05am. So Ronnie on the haul road and stopped to talk w/ him about construction activity since my last visit, and gave him Cells 3&4 E&SC plan sheets 2 to 7. No activity as of yet on any erosion control issues. Site had an inch or more of rainfall yesterday. Ronnie said they were hauling today. Observe SEFA placing structural fill for subgrade in Cell 4 today. SEFA had three 40 ton offroad trucks hauling flyash, to the North side of Cell 4, and Charah had one tri-axle truck hauling bottom fines which were being dumped in the middle of Cell 4. I performed three field density test (FDT) today, all FDT's exceeded 95% compaction and were w/in the required moisture criteria of +/- 3%. Informed SEFA of test results. Picked up proctor sample SG-10, transport to lab and log in. I left jobsite at 3:15 pm.

Jimmy Addis

### On-Site Representative/Company

#### **S&ME Personnel**



To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Time:

3.0

**Services Performed** 

Concrete Testing Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

ı Pine Blvd.	FIELD REPORT					
28273	Date:	Job No.:				
, 53 fax	Oct. 15, 2012	1353-11-032-03				
	Project/Location:					
rformed	MSS Ind. LF #1-Cells 3&4 Subgrade Prep.					
Asphalt Coring	Contractor:	We	ather/Temperature:			
Concrete Coring	SEFA	Clo	udy-showers/60's			
Undercut Evaluation	Present at Site:		***************************************			
Foundation Evaluation						
Proofrolling						
In-Place Density						

Mileage:

80.0

# **Observations/Remarks:**

Onsite at 9:40 am. Walk in and strip form off FGD LF MS-12. Backfill around new concrete pad. Travel to Cells contractor not hauling today. Called Ronnie Puckett, never returned my call. Southland also not doing any construction of the contractor	1
activity in Cells 3&4. I left site at 10:45 am.	

On-Site Representative/Company

Jimmy Addis **S&ME Personnel** 



		LD	) F	RΕ	P	0	R	ł	-	
Date:				Jo	ob	No	.:			

Oct.18,2012

1356-11-032-03

ENVIRONMENTAL SERVICES (707) 020 0000 tax					Project/Location:	
		Services Performed			MSS Ind. LF #1 Cells 3&4	
		Concrete Testing		Asphalt Coring	Contractor:	Weather/Temperature:
		Cylinder Pickup		Concrete Coring	SEFA	Partly cloudy/70's
File		Asphalt Testing		Undercut Evaluation	Present at Site:	
		Steel Testing		Foundation Evaluation		
				Proofrolling		
				In-Place Density		:
		Other (Explain)				
-					Time:	Mileage:
					4.5	80.0
			Services    Concrete Testing   Cylinder Pickup   Asphalt Testing   Steel Testing	Services Pe	Services Performed    Concrete Testing	Services Performed    Concrete Testing

### **Observations/Remarks:**

S&ME representative onsite at noon. Look at E&SC progress, Southland has installed tie-down stakes on downdrain (DD) #2 every 20 ft. beyond berm to end of pipeline. Dug out for sediment storage in front of inlet protection for DD #2. Silt fence has been put up behind soil berm along clearing limits and at apron #2, along each side of the 42 inch pipe. Area needs to be stabilized. Compacted soil liner stockpile stabilization coming along well, a few reels on the slopes noticed. Pictures taken of these areas.

Observe SEFA placing bottom ash in Cell 4 grids A3 and A4 this is in the drainage area leading to downdrain # 2. I did not run any field density test today. SEFA has covered most of the North slope of Cell 4 with soil. It appears to be at least 18 inches thick and should support vegetative cover. I left site at 2:15 pm.

Jimmy Addis

### On-Site Representative/Company

#### S&ME Personnel



To:

File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

Time:

7.0

Concrete Testing

Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

n Pine Blvd.	FIELD REPORT					
28273	Date:		Job No.:			
53 fax	Oct. 22,2012		1356-11-032-03			
	Project/Location:					
rformed	MSS Ind. LF #1 - Cells 3&4 Subgrade Prep.					
Asphalt Coring	Contractor: Weather/Temperature:					
Concrete Coring	SEFA Sunny/70's					
Undercut Evaluation	Present at Site:					
Foundation Evaluation	Ronnie Puckett					
Proofrolling						
In-Place Density						

Mileage:

80.0

# Observations/Remarks:

S&ME representative onsite at 9:30 am. Observe SEFA placing structural fill in Cell 4 for subgrade. SEFA
utilitizing a CAT D6T dozer to spread flyash in approximately a one foot thick lift. A CAT 40 ton offroad water
truck being used to wet and compact the flyash. I waited on the water truck to prepare an area for testing. Today
I performed four field density test (shelby tube method), all test exceed 95% compaction and met the moisture
criteria of +/- 3% of optimum. I informed SEFA of today's test results, refer to attached data sheet. I left jobsite
at 2:30 pm.

On-Site Representative/Company

Jimmy Addis **S&ME Personnel** 

\$S&M	E

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726

(704) 523-4726 (704) 525-3953 fax		Date //-/-/2-	Job No. 1356 · 11 · 032 (03)
		Project/Location	
	Services Performed	MARSHALL STÉAN	STATION LANDPILL SORVERS
To: Rile	☐ Concrete Testing ☐ Asphalt Coring	Contractor	Weather/Temp
To: <u>frle</u>	— Cylinder Pickup Concrete Cori	the state of the s	Summa/60's
-	<ul><li>Asphalt Testing</li><li>Undercut Evaluation</li><li>Steel Testing</li><li>Foundation Evaluation</li></ul>	D	
	Proofrolling	LANC	- Sprit
	_ In-Place Densit	Y ALBERT	SCFA
	Other (Explain)	Time Appared Time	, Mileage
	_ Cilier (Explain)	Time Approved Traise Department	Ena 80,0
		7.5) 1330	80.0
01 11 70	1		
Observations/Remar			
Stone person	of composted a	quested to perfe	row Fors ar
fell pleed a	of associted a	1846-3, C-1".	6 Fort's were performa
and the above	I all pot's me		competion requirement
or and place			
and the Is	to proestine requien	<b>A</b> .	en speed from
enst to west a	ly a DETXL C	et bulldega.	conjuctions
are accommotes	hed after ask is	hydroted	t is trade
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On Site Denvese	rtativo/Company	COME	Personnel NOV 2 2012
On-Site Represer	ntative/Company	30/VIE	Personnel NOV 2 2012



To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

П

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

Site observation

n Pine Blvd.	FIELD REPORT					
28273	Date:	Job No.:				
, 53 fax	11/2/12		1356-11-032-03			
	Project/Location:					
rformed	Marshall Industrial LF No. 1 Cells 3 & 4 / Te					
Asphalt Coring	Contractor:	We	ather/Temperature:			
Concrete Coring	SEFA sunny / 50s					
Undercut Evaluation	Present at Site:					
Foundation Evaluation	Kyle Baucom, S&ME, Inc.					
Proofrolling	Tylo Badooni, Gaivie, mo.					
In-Place Density						
	Time:	Mile	eage:			

80 miles

10:00 AM - 11:30

AM

# **Observations/Remarks:**

S&ME representative on-site at 10:00 AM to observe Cells 3 & 4 construction progress. Compacted soil liner stockpile appeared to have a good stand of vegetation. There were some minor erosion rills on the slopes. SEFA had placed 18 inches of intermediate soil cover on the majority of the south slope. Southland Excavating had finished installing the erosion and sediment control (E&SC) measures consisting of down drain pipe, pipe inlet protection, riprap apron outlet, and the soil diversion berm around the down drain pipe inlet. E&SC measures appeared to be installed correctly. SEFA was hauling ash to Grid D2 as part of the Cells 3 and 4 structural fill subgrade.

S&ME representative drove to the existing road between the closed asbestos and C&D landfills to perform field measurements of the existing road width. S&ME representative left the site at 11:30 AM.

Kyle Baucom

#### On-Site Representative/Company

#### **S&ME Personnel**

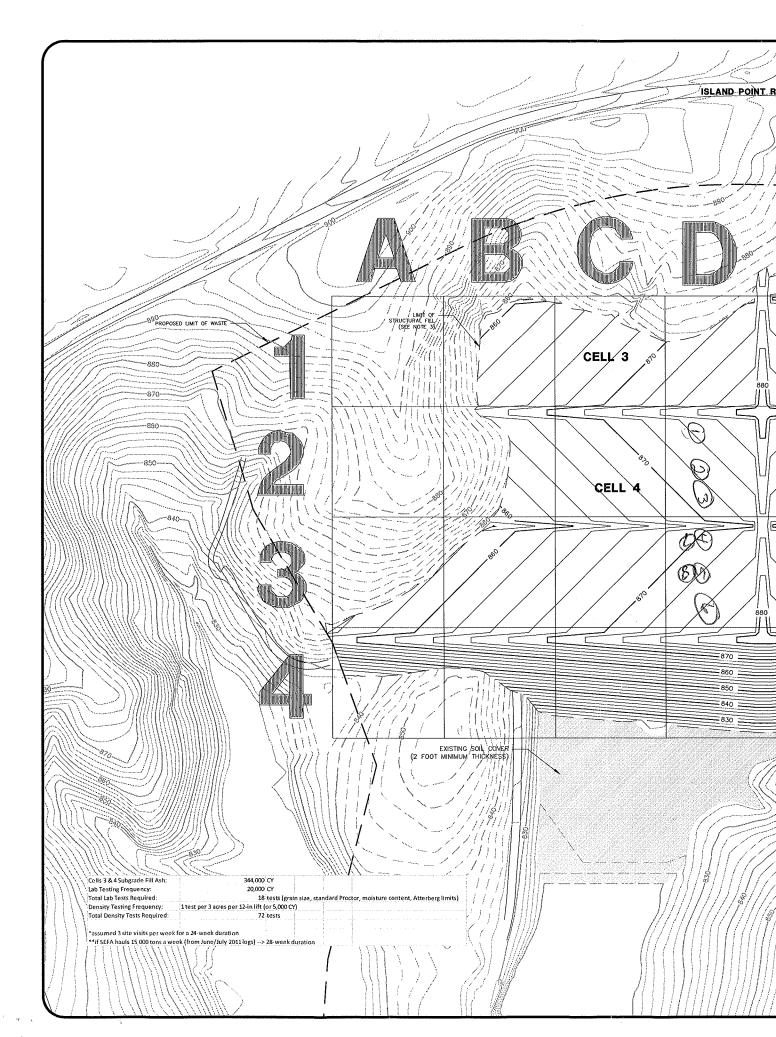
Disclaimer: The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. The information presented in this field report should be considered preliminary until it is reviewed by an engineer.

1 Page 1

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<b>4</b> C Q . M		I 9751 Southern Pine Blvd Charlotte <sub>x</sub> -NC 28273		d Report
OCIV	(704) 523	~. \	Date	Job No.
	· ·	-3953 fax	12-11-12	PIHASE 3
		Value of the second	Project/Location	1356-11-032
	Sorrico	s Performed	Nod Cel	ls 3+4.
	☐ Concrete Testing		MARSHALL STER	m STATI on INDUSTRUL (musifi Weather/Temp
To: file	<ul><li>Concrete Testing</li><li>Cylinder Pickup</li></ul>	Concrete Coring		wedner/ lemp
	☐ Aspholt Testing	☐ Undercut Evaluation	SEFA	chandy 50's
	☐ Steel Testing	Foundation Evaluatio	Present at Site	_
	_	Proofrolling In-Place Density	*	re-Syme
-		III-Fluce Defisity	ALB	enof SERA
		·		
	Other (Explain)	·	Time	Mileage
			9,01	100.0
delivering it	to the	fill area.	ing ask from ASH is be	ing spread from
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**On-Site Representative/Company** 

**S&ME Personnel** 





FIELD R	REPORT
Date:	Job No.:
12/27/12	1356-11-032-03
Project/Location:	

						Project/Location:	
			Services	Pe	erformed	Marshall Industrial L NC	F No. 1 Cells 3 & 4 / Terrell,
			Concrete Testing		Asphalt Coring	Contractor:	Weather/Temperature:
			Cylinder Pickup		Concrete Coring	SEFA	sunny / 50s
To:	File		Asphalt Testing		Undercut Evaluation	Present at Site:	
			Steel Testing		Foundation Evaluation	Kyle Baucom & Earl	Alexander, S&ME, Inc.
					Proofrolling	Ronnie Puckett, SEF	FA
					In-Place Density		
		$\boxtimes$	Other (Explain)				
		Site	observation			Time:	Mileage:
						10:00 AM - 12:00 PM	80 miles

### **Observations/Remarks:**

S&ME representative on-site at 10:00 AM. Drove to Cells 1 and 2 to look at the status of the erosion and sediment control (E&SC) measures at the southeast corner of Cell 2 and through the C&D and asbestos landfill borrow area. The existing east perimeter channel (EPC4) was actually constructed through the C&D and asbestos landfill borrow area rather than west of this borrow area. The first 120 feet of channel after the culvert was eroded in several areas. Additionally, several rock check dams had been eroded around. The shallower portion of the channel through the borrow area contains rock check dams, and it is vegetated and stable. It should be noted that there was previously a silt fence outlet installed at the low portion of the borrow area, and it had been eroded under and the stone had been washed out. The existing wetland downstream of the borrow area was not impacted by the borrow area, adjacent landfill closures, or adjacent stockpiling.

At 10:45, drove to Cells 3 and 4 subgrade area to meet Ronnie Puckett with SEFA. We discussed the status of the E&SC measures in the Cells 3 and 4 subgrade area. I explained that the intent of diversion channel DC-1 in the Stages 4 & 5 E&SC Plan was to prevent runon from the upslope native ground. However, given how close SEFA is to grade, they should begin tying into the existing soil slope. I also explained to Ronnie that we would send SEFA an updated grading plan based on the revised rough subgrade plan in the Permit to Construct Revision rough subgrade drawing. Ronnie explained there was approximately 3 inches of rain at the site within the past 2 days, and that they would begin E&SC maintenance of the pipe inlet protection at Down Drain 2 and the check dams in Channel B once the area had dried up a little.

SEFA was hauling ash to Grids B3 and C3 as part of the Cells 3 and 4 structural fill subgrade. Collected bulk sample SG-13 for laboratory testing. Earl Alexander was also on-site performing field density and moisture tests. He explained that the compaction and moisture criteria were being met for the tests that he had performed. S&ME representative left the site at 12:00 PM.

Kyle Baucom

#### On-Site Representative/Company

### **S&ME Personnel**

\$S&MI	9751 Southern Pine Blvd Charlotte, NC 28273	Field	Report
OCIVII	(/04) 523-4/26	Date	Job No. 03
•	(704) 525-3953 fax	1-31-13	1356-11-032
		Project/Location	
	Services Performed	MANSHAM STEAM STA	ria Inocratual Canal
To: Pul	☐ Cancrete Testing ☐ Asphalt Coring	Contractor	Weather/Temp
10.	☐ Cylinder Pickup ☐ Concrete Coring ☐ Undercut Evoluotion	SEFA	Sunn 150/s
	Steel Testing	Present at Site /	
	☐ Proofrolling	Helia Helia	isnt-SOFA
	In-Place Density	dens	ne - Stue
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	Other (Explain)  Annual  05 00  De Annual to	4 8 5 x	1/00.0
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Observations/Remark	·s·		
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**On-Site Representative/Company** 

**S&ME Personnel** 

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<b>\$</b> 58	ZME

To:

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Asphalt Coring

Praofrolling In-Place Density

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

n Pine Blvd 28273	Field Report			
26	Date	Job No. 63		
53 fax	2-6-13	1356-11-032		
	Project/Location			
erformed	MANISHALL STRAM STATIO	in Indisornal Constil		
Asphalt Coring	Contractor	Weather/Temp		
Concrete Coring	SCRA	Sunny /60's		
Undercut Evaluation Foundation Evaluation	Present at Site	7,600		
Praofrolling	Grane	- Stme		
In-Place Density	ALBURT.	- Stra		
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	Time /	Mileage		

	Other (Explain)	Time	Mileage
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Observations/Remarks	S:		<u>.                                    </u>
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On-Site Represente	ıtive/Company	58	ME Personnel

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Page \_\_\_\_ of \_\_\_\_\_

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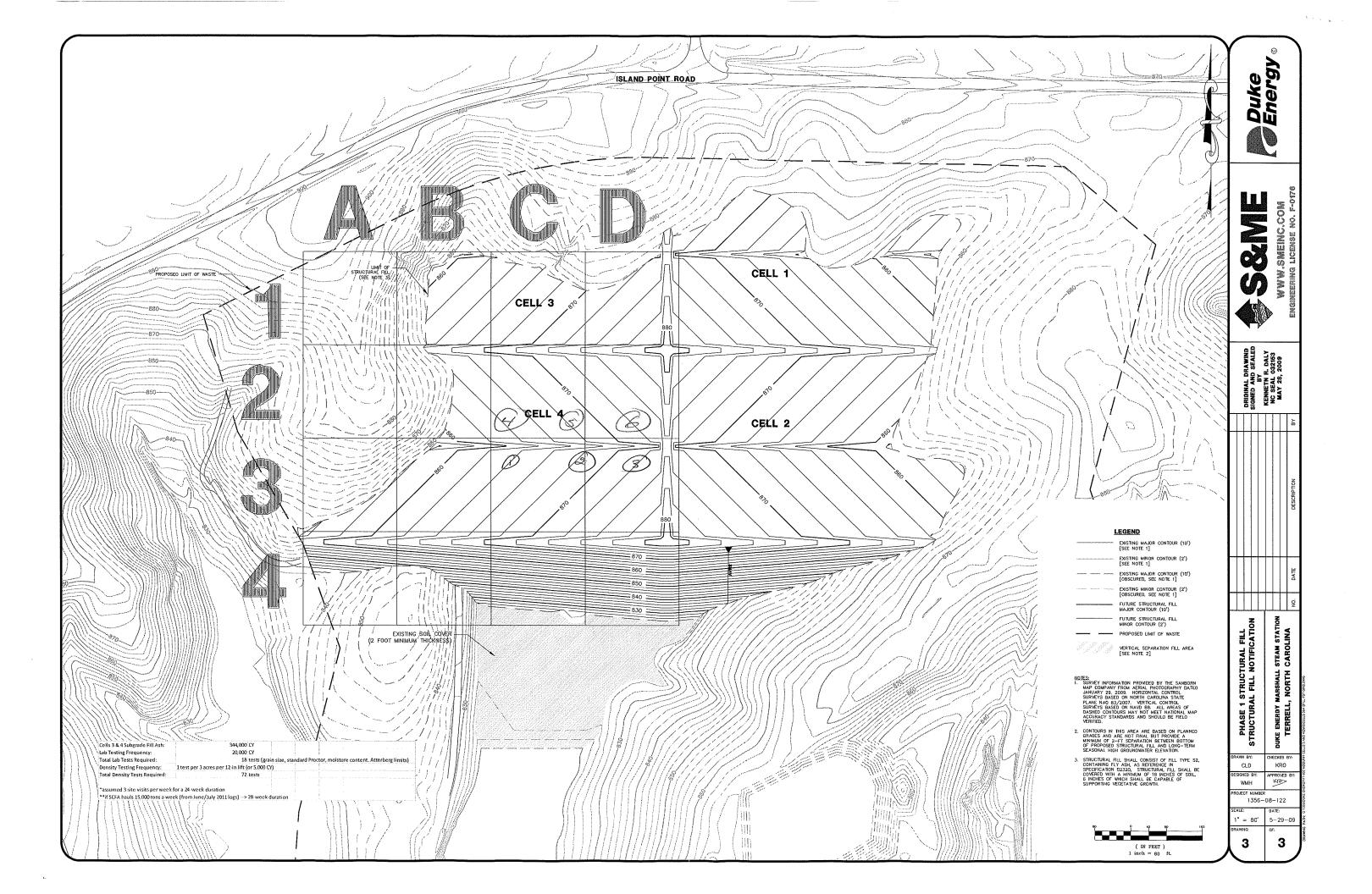
Field	Report
Date	Job No. PHASE 3
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	<u>~</u>		Services	s Performe	d	MARSHALL	STARM S	TETION I		
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To:	Filo		Cylinder Pickup	Concrete C	-		4	ما	•	
			Asphalt Testing	Undercut E	valuation	SEFI		James	1./605	
-			Steel Testing	☐ Foundation	Evaluation	Present at Si	te Lani-	Surre	ı	
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Obs	servations/Remarks									
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On-Site Representative/Company

**S&ME Personnel** 

FEB 28 2013



S	&N	/	

Field	Report
Date	Job No. PHASE 3
3-15-13	1356-11-032
Project/Location	

	(704) 323	0730 IUA	5-13-13	1336-11-032
			Project/Location	
	Services	s Performed	MARSHALL STEAM	n STATION-INDUSTRIAL LANGEL
To: File	T .	Asphalt Coring	Contractor	Weather/Temp
10.	<ul><li>Cylinder Pickup</li><li>Asphalt Testing</li></ul>	<ul><li>Concrete Coring</li><li>Undercut Evaluation</li></ul>	SEFA	Sunny/50's
	☐ Steel Testing	☐ Foundation Evaluation	Present at Site	anc- Strie
		☐ Proofrolling ☐ In-Place Density		unit - SCRA
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**On-Site Representative/Company** 

**S&ME Personnel** 

MAR 1 8 2013

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Fie	eld Report	
Date	Job No.	07
4-30-13	1356-11-0	32

Project/Location

		Services	71	errormen	MARSHALL STEAM STAT	you Tapus oned Canofill
ma. 7.7		Concrete Testing		Asphalt Coring	Contractor	Weather/Temp  Llondy/605  CHARAH LARIS  TME
To:		Cylinder Pickup		Concrete Coring	011.	
		Asphalt Testing		Undercut Evaluation	CHARALL	cloudy 605
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Observations/Remarks	•					
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On-Site Representative/Company

**S&ME Personnel** 

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To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

Site observation

Pine Blvd.	FIELD REPORT				
28273	Date:	Job No.:			
, 53 fax	05/13/13		1356-11-032-03		
	Project/Location:				
rformed	Marshall Industrial LF No. 1 Cells 3 & 4 / Terr NC				
Asphalt Coring	Contractor:	ather/Temperature:			
Concrete Coring	Charah sun		unny / 70s		
Undercut Evaluation	Present at Site:				
Foundation Evaluation	Kvle Baucom & Jaso	n Re	eves, S&ME, Inc.; Darrell		
Proofrolling	Wolfe, Geoge Tolbert, Sherrie Christopher, Du Walter Fox, Charah				
In-Place Density					
	7				
	Time: Mileage:				

80 miles

10:00 AM - 12:30

PM

# **Observations/Remarks:**

S&ME representatives on-site at 10:00 AM. Drove to Cells 1 and 2 to observe the chimney drains. Charah was grading around the chimnney drains. Walter Fox explained that Charah had clipped the face of the bottom ash from around the chimney drains. He also explained there were 3 chimney drains that seemed to be functioning properly, while there were 3 chimney drains that seemed to drain slowly. The 3 chimney drain locations function properly are the most upstream chimney drain in Cell 1 (CD-1), most upstream chimney drain in Cell 2 (CD-2) and the chimney drain near the Cell 2 sump (CD-3). The 3 chimney drain locations that drained more slowly are the chimney drain at the Cell 1 sump (CD-4), at the middle of Cell 1 (CD-5), and at the middle of Cell 2 (CD-6). Sherrie Christopher also explained that she had noticed issues with the pumps for the LCS and LDS. Kyle Baucom explained that S&ME would collect a bulk sample of bottom ash to perform a grain-size analysis on the material.

Parties drove to Cell 3 and 4 structural fill subgrade to observe construction progress. Walter Fox explained that Charah uploaded the most recent drawing into their GPS unit for the equipment, and it appeared that the subgrade was overbuilt by up to 3 feet in some spots. Kyle Baucom explained that the required tolerance per the specifications was + or - 3 inches. Walter Fox explained that Charah would stop hauling silo ash to the Cell 3 and 4 structural fill subgrade, and begin balancing the cut/fill in this area. He explained that he believed overall the cut and fill would balance out. Kyle Baucom explained that it appeared that there is some fill needed along the western side to bring the fill up to grade. He explained that the intent at the end of ash placement is to cut a ditch into the soil cut slope and maintain a 1 percent sloped ditch to drain to the southwestern corner. Walter Fox explained that Charah would compare the existing grade to the plan to see how much additional fill is needed along this western ditch.

Following the discussion, S&ME representatives drove to the Cell 1 and 2 control panel areas to test the pumps. The LCS low flow pumps for Cell 1 and 2 were both pumping at the time of the observation. The Cell 1 LCS high flow pump, Cell 1 LDS low flow pump, and Cell 2 LDS low flow pumps functioned properly when manually turned on. The audible alarams also worked for each control panel. The Cell 2 high flow pump did not pump when manually turned on. The liquid level was approximately 8 inches. Kyle Baucom explained that it is likely that the Cell 2 high flow pump is higher than the 8-inch liquid level. He explained that during Cell 1 and 2 construction, there was a high flow pump that was caught on the 18-inch diameter riser pipe bend at the 3H:1V side slope and the cell floor. He explained that this pump should be monitored to verify that it operates at higher liquid levels.

Following testing of the pumps, S&ME representatives drove to Cell 2 to collect a sample of bottom ash from chimney drain CD-6 (see chimney drain location descriptions above). S&ME representatives then observed each chimney drain. CD-4, CD-5, and CD-6 appeared to have a layer of caked fines over the bottom ash material and watermarks were apparent. The bottom ash behind the exterior layer of caked fines at CD-4 and CD-5 appeared to contain a significant amount of fines. The bottom ash behind the exterior layer of caked fines at CD-6 appeared to contain less fines. A sample of this bottom ash was collected for grain-size analysis. CD-1 and CD-2 appeared to have coarser bottom ash material. CD-3 appeared to have bottom ash with a significant amount of fines similar to CD-4 and CD-5.

S&ME representatives left the site at 12:30 PM.

Kyle Baucom

#### On-Site Representative/Company

## S&ME Personnel

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To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing

Cylinder Pickup

Asphalt Testing

Other (Explain)

Steel Testing

n Pine Blvd.	FIELD REPORT			
28273	Date:		Job No.:	
53 fax	5/13/13		1356-11-032	
	Project/Location:			
rformed	Marshall Steam Station			
Asphalt Coring	Contractor: Weather/Temperatu			
Concrete Coring	Charah 60's		:	
Undercut Evaluation	Present at Site:			
Foundation Evaluation	George Tolbert, She	rrie C	hristopher Darrell	
Proofrolling	Wolfe- Duke			
In-Place Density	Walter Fox, Chris Allen - Charah			
	Jason Reeves, Kyle Baucom - S&ME			
	Time: Mileage:			

9 am - 2:30 pm

# **Observations/Remarks:**

S&ME engineers visited the site as requested by Duke Energy to observe the existing chimney drains at the Marshall Cells 1 and 2 ash landfill. Upon arrival at the site, the following were observed and discussed:

- 1) The Cells 3 and 4 area was observed. The grades were determined to be too high in several areas from the subgrade grading plan due to not previously having GPS ground control in place. Charah will work to regrade the ash to within the project grading tolerances.
- 2) Erosion was occuring along the western of the Cells 3 and 4 area. It was discussed that the drainage ditch should be constructed in residual soil. Erosion of the ash is occurring along this area. It was discussed that slope protection may be required to convey stormwater flows toward the ditch to help reduced erosion in the southwestern portion of the subgrade area where gully erosion has occurred. Once Charah completes the subgrade grading, Duke will contact S&ME for another site visit.
- 3) The power line re-alignment area to the west of Cells 3 and 4 was observed to be under construction.
- 4) The Cells 1 and 2 pumps were discussed. One based on a conversation with Sherrie Christopher of Duke, one of the high flow pumps did not appear to be working. The low flow and high flow pumps were manually operated and appeared to be working with the exception of the Cell 1 high flow pump. It is possible that the head in the high flow sump is not adequate to activiate the pump. Kyle Baucom will discuss this with Sherrie Christopher of Duke.
- 4) The chimney drains for Cell 1 and Cell 2 were observed. According to Chris Allen of Charah, 3 of the chimney drains are draining slowly over a period of about 2 days, while the rest of the drains appeared to be performing well.

Kyle Baucom and Jason Reeves of S&ME observed the slowly draining chimney drains and the ones that appeared to be performing well. It appears that a layer of caked fly ash was present in the poorly performing chimney drains. The outer bottom ash material also appeared to contain a significant amount of fines (in some areas 50 percent or more fines). We recommend that the fly ash cake and bottom ash with more significant fines be removed and replaced with cleaner, granular bottom ash without a significant amount of fines (less than 10 percent fines).

Jason S.	Reeves
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# **On-Site Representative/Company**

#### S&ME Personnel

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\$S&ME	

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Flel	a Report	
Date	Job No.	03
5-17-13	1356-11-	-032

							1/00/0-11-400	4
					Project/Lo	ocation		
		Services	s P	erformed	MARKHI	926 STEAMST	ATION INDUSTRICALIAN	w.h
Го:	N D.	Concrete Testing		Asphalt Coring	Contracto		Weather/Temp	
10.	ja	Cylinder Pickup Asphalt Testing		Concrete Coring Undercut Evaluation	CHARI	4H	Sunny 180's	
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Observations/Remarks:
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CAT DEN LAP bulldagen. 9- FOT's were performed
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were re-hydrated and re-rolled. all areas
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On-Site Representative/Company

S&ME Personnel

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To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

Site observation

n Pine Blvd.	FIELD REPORT				
28273 5	Date:		Job No.:		
53 fax	08/22/13		1356-11-032-06		
	Project/Location:				
rformed	Marshall Industrial LF No. 1 Cells 3 & 4 / Terrel NC				
Asphalt Coring	Contractor: Weather/Temperatur				
Concrete Coring	Charah	sun	unny / 80s		
Undercut Evaluation	Present at Site:				
Foundation Evaluation	Kyle Baucom, S&ME	. Inc.	; Darrell Wolfe, Duke		
Proofrolling	Tryle Baassin, Gaine, mo., Bansii Trone, Bans				
In-Place Density					
	Time: Mileage:				

80 miles

12:30 PM - 2:00

PM

# **Observations/Remarks:**

S&ME representative arrived on-site at 12:30 PM. Drove to Cells 3 and 4 to observe the structural fill closure construction. Charah was on their lunch break upon arrival. Met with Darrell Wolfe to discuss construction progress. Based on the construction grid, Charah had placed a 6-inch thick compacted lift of soil in Grids C1, C2, D1, and D2. Soil was being excavated and hauled from Stockpile #5 just to the south of Cells 3 & 4. Soil was being placed in an approximate 8-inch thick loose lift and compacted with a sheepsfoot roller to a 6-inch thick compacted lift. While on-site, Charah's water truck was being utilized for dust control on the haul roads. Based on conversations with Darrell Wolfe with Duke and Jim Williams with Charah, the construction plan is to place a 6-inch thick lift of soil over the Cells 3 and 4 area, followed by an additional 6-inch thick lift of soil to achieve the 12 inches of structural fill soil cover, and then follow with a 6-inch thick lift of topsoil. Charah has continued to maintain E&SC measures from recent rains.

Following observations at Cells 3 & 4, the S&ME representative drove with Darrell Wolfe to observe erosion issues occuring adjacent to the northern perimeter road that was installed as part of the transmission line relocation project. Driving to the west on the perimeter road, there were 2 roadside channels on the left side of the road that were eroded. Darrell Wolfe explained that the channels had been seeded and check dams had been installed following construction, but erosion had continued to occur in the channel. There was a similar channel to the right of the perimeter road. This channel had also been seeded and erosion control matting and check dams had been installed in the channel. However, erosion has continued to occur. Suggested that 18 inches of Class B riprap underlain by an 8 oz/sy nonwoven geotextile would be a permanent stabilization alternative since vegetation would not establish in the channels. S&ME representative left the site at 2:00 PM.

Kyle Baucom

## On-Site Representative/Company

## S&ME Personnel

Disclaimer: The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. The information presented in this field report should be considered preliminary until it is reviewed by an engineer.



9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726

# Field Report

4		(704) 525-	3953 fax	8-23-13	1356-11-032
				Project/Location	cello 3+4
		Services	s Performed	MARSHALL TNOWS	
To:	Rile	☐ Concrete Testing ☐ Cylinder Pickup	☐ Asphalt Coring ☐ Concrete Coring		Weather/Temp
	•	☐ Asphalt Testing	☐ Undercut Evaluation	CHARLAH	Sunoy /80's
		☐ Steel Testing	Foundation Evaluation Proofrolling In-Place Density	Jim	- CHARRAH-CHRIS
		Other (Explain)		Time 7.5	Mileage 100.0
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	vations/Remark	1	7		, , , , , ,
4.50	Stre per	sonnel or	a sile as	agreeted &	4 perform PDIS
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On-Site Representative/Company

**S&ME Personnel** 

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To: File

9751 Southern Pine Blvd. Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

**Services Performed** 

П

Asphalt Coring

Proofrolling In-Place Density

Concrete Coring

Concrete Testing

Cylinder Pickup

Asphalt Testing

Steel Testing

Other (Explain)

Site observation

 $\boxtimes$ 

# FIELD REPORT Job No.: Date: 08/29/13 1356-11-032-06 Project/Location: Marshall Industrial LF No. 1 Cells 3 & 4 / Terrell, Contractor: Weather/Temperature: Charah sunny / 80s Present at Site: **Undercut Evaluation** Foundation Evaluation Kyle Baucom, S&ME, Inc.; Darrell Wolfe, Duke; Jim Williams, Charah Time: Mileage:

80 miles

10:15 AM - 12:00

PM

# **Observations/Remarks:**

S&ME representative arrived on-site at 10:30 AM. Drove to Cells 3 and 4 to observe the structural fill closure construction. Charah had placed the 2<sup>nd</sup> 6-inch lift of soil over most of the Cells 3 and 4 area. The northern area had been cleared as shown on the drawings. Charah had excavated out most of the wet ash in the northern area due to ponding of water in this area. The area appeared to be approximately 30 feet wide by about 60 feet long. The S&ME representative drove to Cells 1 and 2 to probe compacted ash to establish a base line probe depth for compacted ash. Under body weight, the probe extended approximately 3 inches into the compacted ash in the landfill. The upper 20-foot wide strip was probed to a depth of 2 to 3 inches over the 60-foot length, so this area appeared to be acceptable. The lower 10-foot wide strip appeared to be softer and have standing water. This material was excavated to a depth of about 1.5 to 2 feet to underlying soil. The wet ash was removed and hauled off. Jim Williams explained that this area would be backfilled with soil.

Based on the area where Charah had cleared and removed topsoil, it appeared that there would be positive drainage from the north end of the area to the start of the western diversion channel. Jim Williams explained that Charah plans to be finished with the project during the week of September 16-20. S&ME representative left the site at 12:00 PM.

Kyle Baucom

## On-Site Representative/Company

# S&ME Personnel

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50	3	M	E
	,	50	

To:

9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing

Cylinder Pickup

Asphalt Testing

☐ Steel Testing

Other (Explain)

Time

Field Report

Job No.

3953 fax	8-30-13	1356-11-032 calls 3+4
Performed	Project/Location	
☐ Asphalt Coring ☐ Concrete Coring ☐ Undercut Evaluation		Weather/Temp Summer / PD's
Foundation Evaluation Proofrolling In-Place Density	Present at Site	CHAMERY

Observations/Remarks:

**On-Site Representative/Company** 

**S&ME Personnel** 

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9751 Southern Pine Blvd Charlotte, NC 28273 (704) 523-4726 (704) 525-3953 fax

Services Performed

Concrete Testing
Cylinder Pickup

Concrete Coring

Lien	a mehorr
Date	Job No.
9-3-13	1352-11-032
Project / Location	usual canocil
Contractor	Weather/Temp
CHARRAY	Summes 18 ds
Present at Site	
DONNY JAY- EAM	- CHARLAIT - SKME
Time /	Mileage

**On-Site Representative/Company** 

S&ME Personnel

SEP 4 201

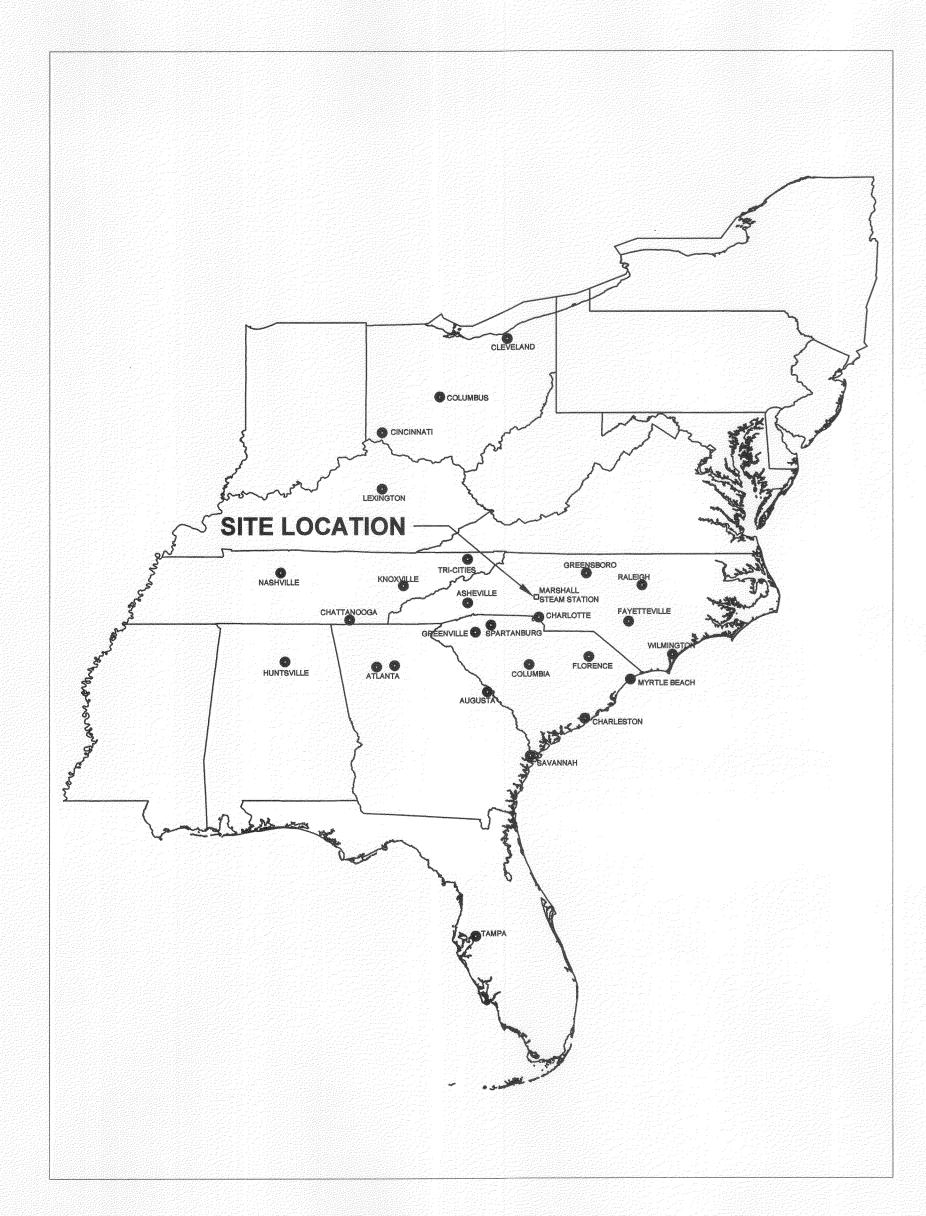
**Disclaimer:** The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. **The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.** 





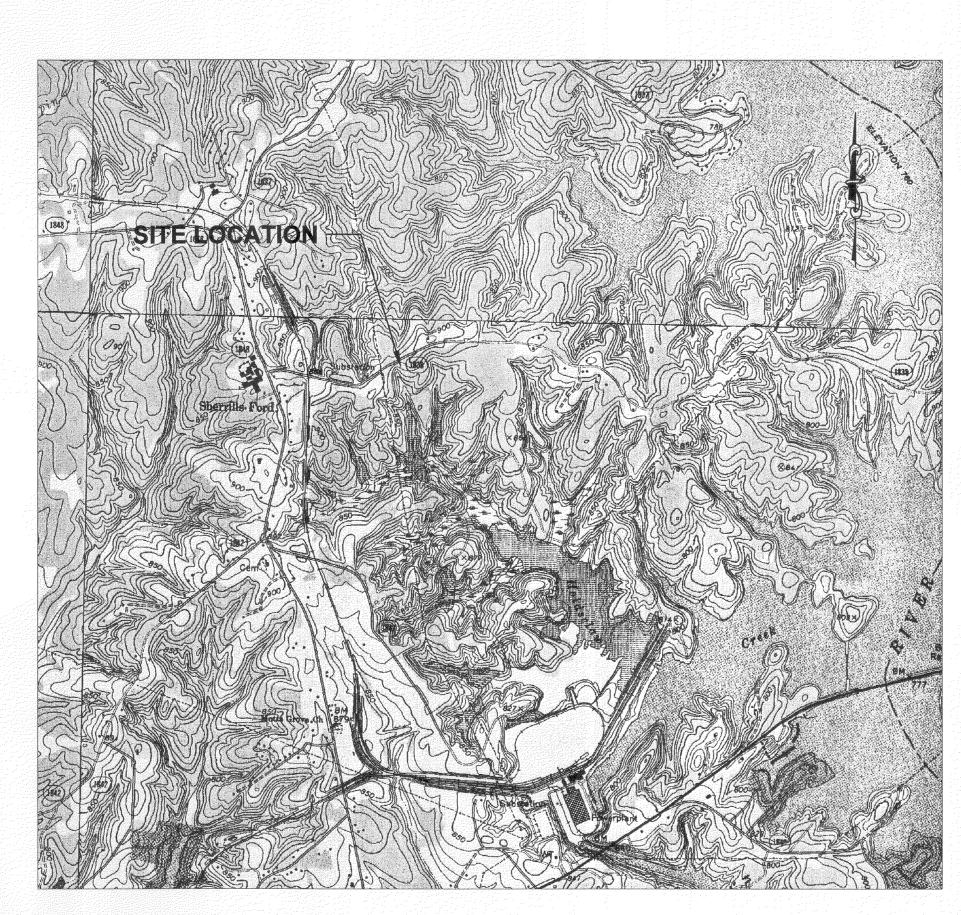
# CELLS 3 AND 4 STRUCTURAL FILL CLOSURE MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1 ISSUED FOR CONSTRUCTION

DUKE ENERGY - MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA
AUGUST 2013



LOCATION / S&ME OFFICE MAP

NOT TO SCALE



SITE VICINITY MAP

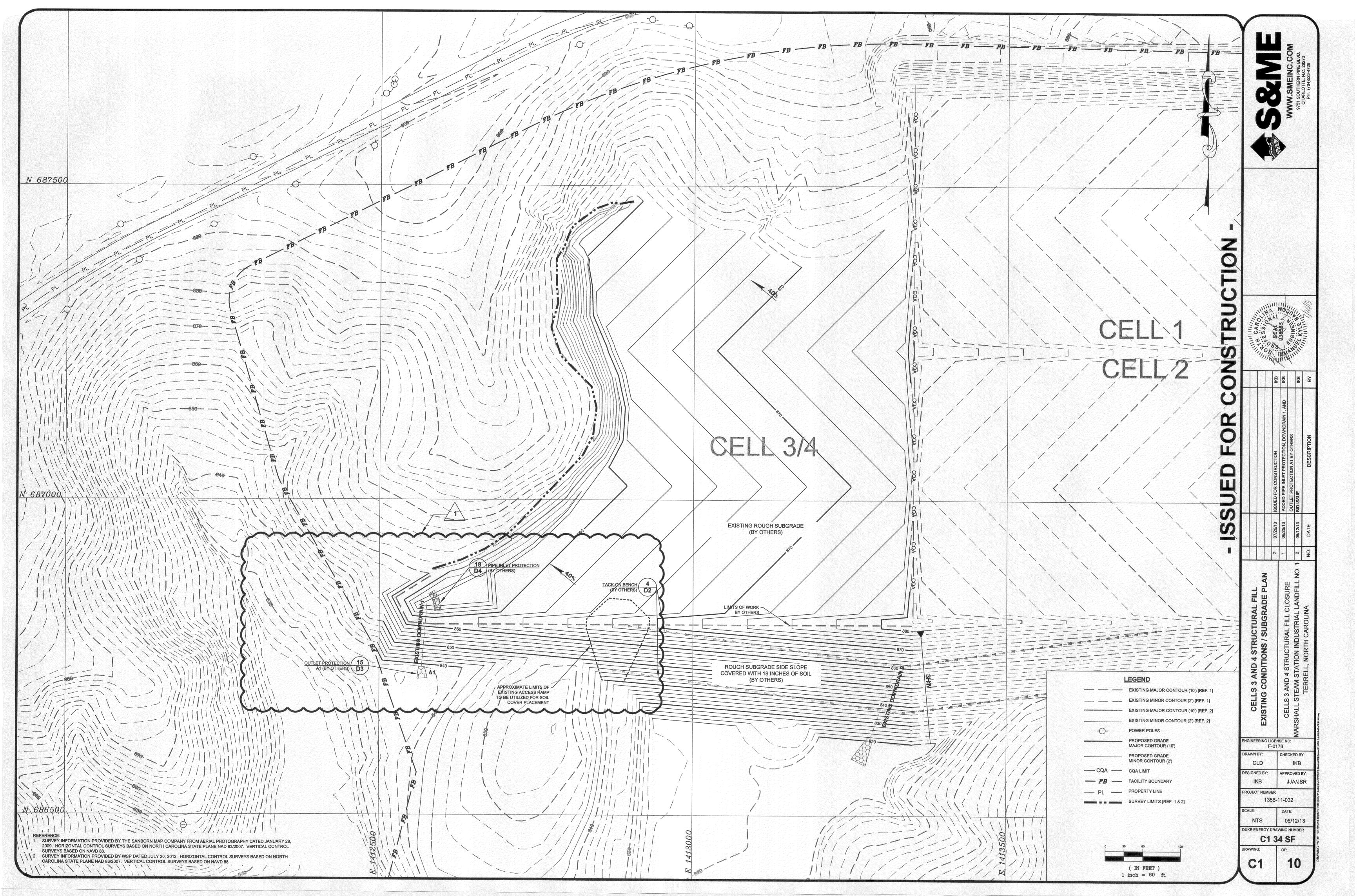
DRAWING	
CO	COVER SHEET
C1	CELL 3 AND 4 STRUCTURAL FILL EXISTING CONDITIONS / SUBGRADE PLA
C2	CELL 3 AND 4 STRUCTURAL FILL CLOSURE PLAN
C3	CELL 3 AND 4 STRUCTURAL FILL STORMWATER MANAGEMENT PLAN
C4	CELL 3 AND 4 STRUCTURAL FILL BORROW/STOCKPILE AREA PLAN
D1	CLOSURE & STORMWATER DETAILS 1
D2	CLOSURE & STORMWATER DETAILS 2
D3	E&SC DETAILS 1
D4	E&SC DETAILS 2
D5	E&SC DETAILS 3

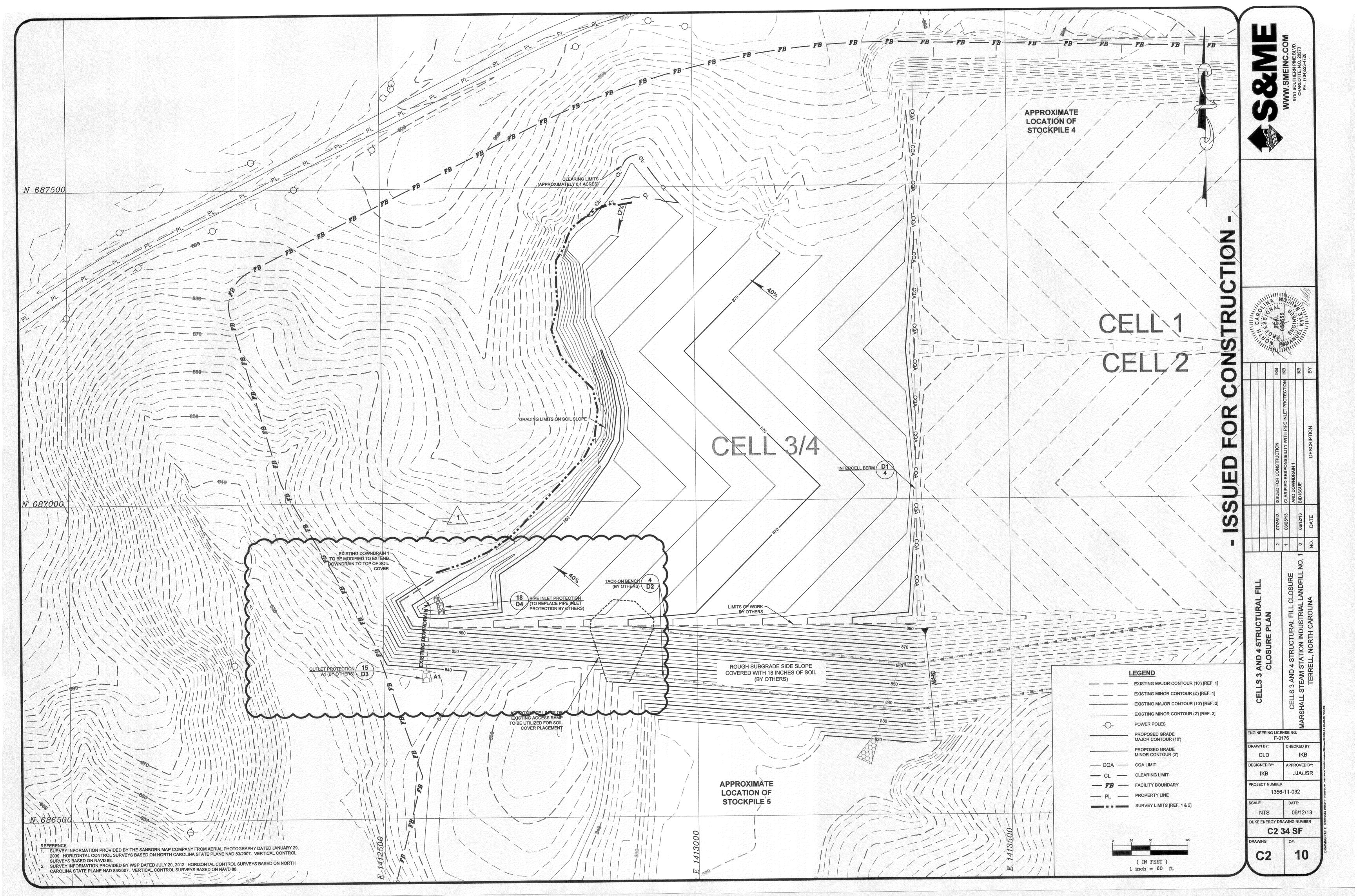
WWW.SMEINC.COM 9751 SOUTHERN PINE BLVD. CHARLOTTE, N.C. 28273 PH. (704)523-4726

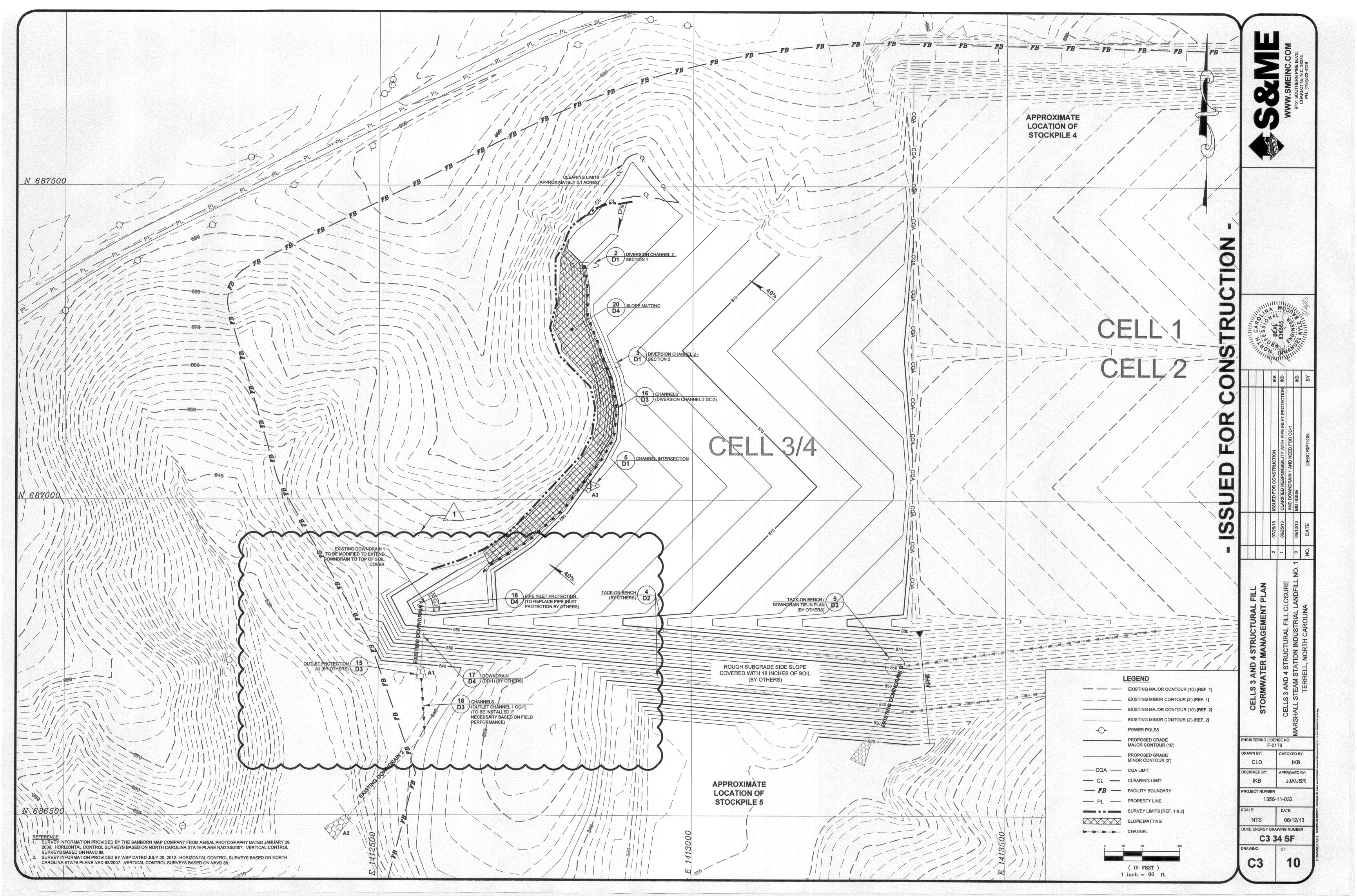


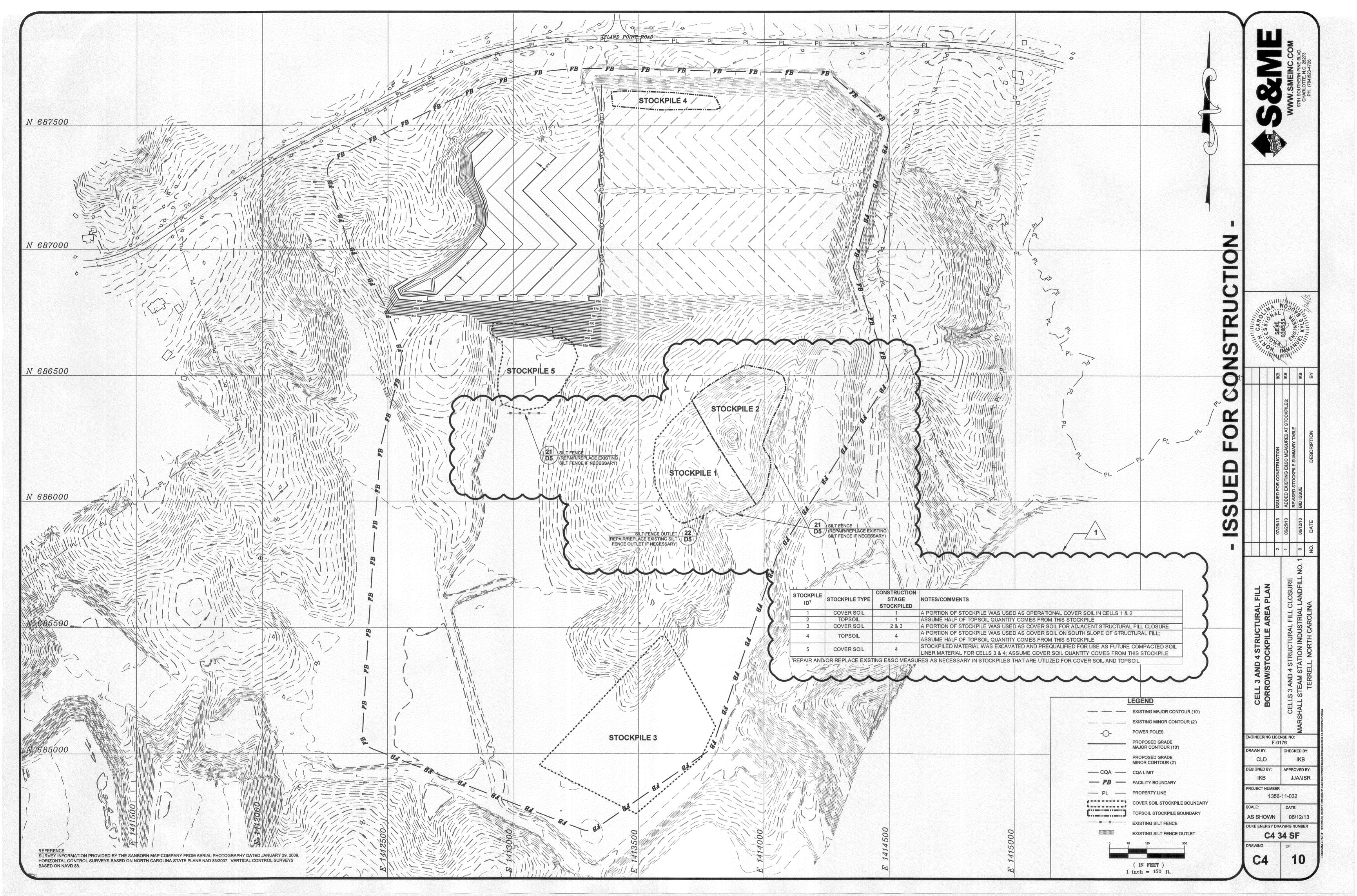
90	DATE	Š.	TERRELL, NORTH CAROLINA
BID ISSUE	06/12/13	0	TEAM STATION INDUSTRIAL LANDFILL NO. 1 0 06/12/13
ADDED DRAWING D5	06/25/13		S AND 4 STRUCTURAL FILL CLUSURE
ISSUED FOR CONSTRUCT	07/26/13	7	

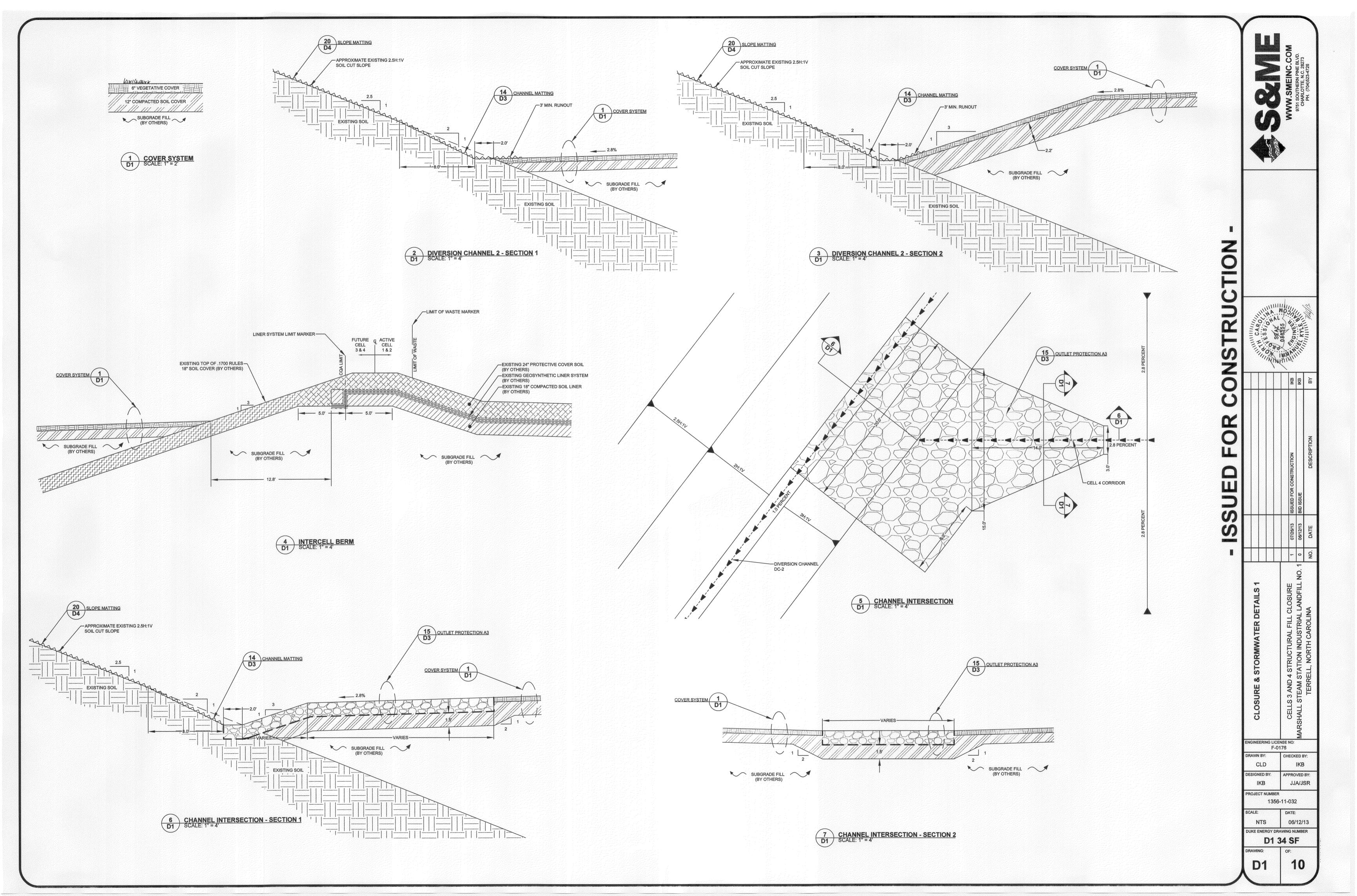
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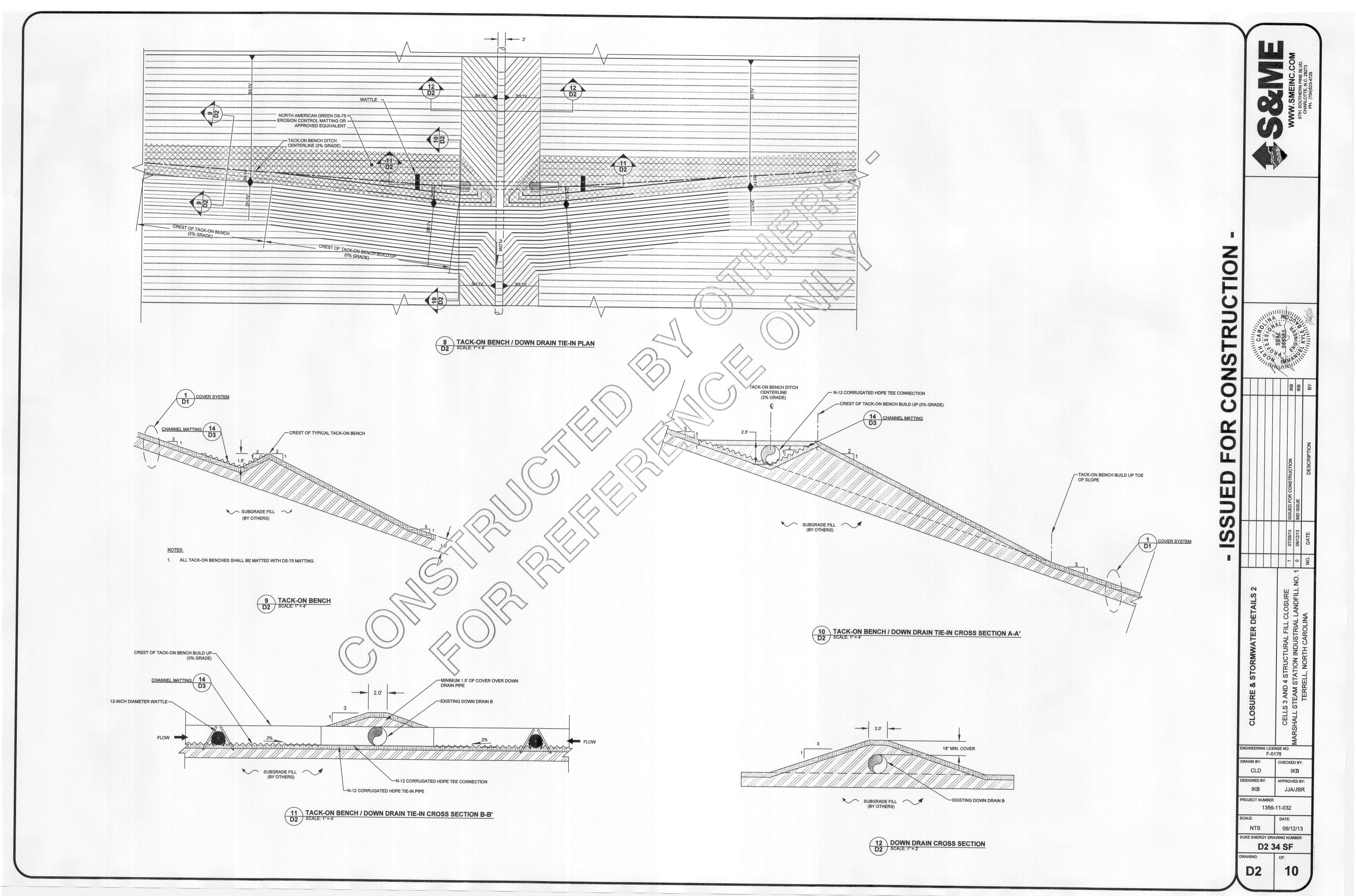












Controlling runoff and erosion on disturbed areas by establishing perennial vegetative cover with seed.

To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

# <u>SPECIFICATIONS</u>

Establishment of vegetation should not be attempted on sites that are unsuitable due to excessive soil compaction, inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil

Enough fine-grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at

Sufficient pore space to permit root penetration.

least .05 inches water to 1 inch of soil).

Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.

A favorable pH range for plant growth, usually 6.0 - 6.5.

• Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met - i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation - special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoll may be applied.

Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

 Ground agricultural limestone: Heavy-textured, clavey soils: 2-3 tons/acre

Light-textured, sandy soils: 1 to 1-1/2 tons/acre Fertilizer: Grasses: 800-1200 lb/acre of 10-10-10 (or the equivalent) Grass-legume mixtures: 800-1200 lb/acre of 5-10-10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4-6 inches of soil by disking or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30-50%. Always take this into account in scheduling land-disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non-certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Apply seed uniformly with a cyclone seeder, drop-type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern: then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

appropriate for permanent seeding.

Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible. Reseeding-If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over- seed the stand. Consider seeding temporary, annual species if the time of year is not

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization-On the typical disturbed site, full establishment usually requires re-fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

TEMPORARY SEEDING SPECIFICATIONS Seeding mixture (fall)

Species\* Rate (lb/acre) Rye Grain (Secale cereale) Seeding Mixture (late winter early spring) Rate (lb/acre) Rye Grain (Secale cereale)

Seeding mixture (summer)

Annual Rye (Lolium multiflorum Lam.)

straight can be used as a mulch anchoring, tool.

Species\* German Millet (Setaria Italica)

Seeding dates (Piedmont) Late winter (early spring)

Jan. 1 - May 1 Late Summer: May 1 - Aug. 15

Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly

Rate (lb/acre)

Aug. 15 - Dec. 30

Re-fertilize if growth is not fully adequate. Reseed, re-fertilize and mulch immediately following erosion or other damage.

\*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

PERMANENT SEEDING SPECIFICATIONS

Rate (lb/acre) Tall fescue (Festuca arundinacea) (Grass lined Channels) 200 Tall fescue (Festuca arundinacea) (Other Areas)

Nurse plants

Between May 1 and Aug. 15, add 50 lb/acre German millet (Setaria italica). Prior to May 1 or after Aug. 15, add 50 lb/acre Rye Grain (Festuca arundinacea).

Seeding dates

Late winter

Feb. 1 -Apr. 15

Fall is best for tall fescue (Festuca arundinacea) and late winter or summer for lespedeza.

Feb. 15 - Mar. 21

Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10

Apply 4,000-5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

Re-fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

\*REF: 6.11L NC Erosion and Sediment Control Planning and Design Manual, 2006

OVER-SEEDING SPECIFICATIONS

Cut existing vegetation within area to be over-seeded as short as possible, down to 1-inch height. Aerate the area to be over-seeded.

Seeding mixture (fall)

Species\* Rate (lb/acre) Tall fescue (Festuca arundinacea) Rye Grain (Secale cereale)

Seeding Mixture (late winter early spring)

Species\* Rate (lb/acre) Tall fescue (Festuca arundinacea) Rye Grain (Secale cereale)

Seeding mixture (summer)

Rate (lb/acre) German Millet (Setaria italica)

Seeding dates (Piedmont)

Aug. 15 - Dec. 30 Late winter (early spring): Jan. 1 - May 1 Late Summer: May 1 - Aug. 15

Slopes 3:1 or flatter

All other areas with slopes flatter than 4:1

Apply 4,000-5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

14 days

STABILIZATION TIME FRAMES (EFFECTIVE AUG. 3, 2011)

SITE AREA DESCRIPTION STABILIZATION **TIMEFRAME EXCEPTIONS** Perimeter dikes, swales, ditches, slopes 7 days High quality water (HQW) zones 7 days None Slopes steeper than 3:1 7 days If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed

# GENERAL SEEDING SPECIFICATIONS





TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISSIPATING THE ENERGY. **CONSTRUCTION SPECIFICATIONS:** 

ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING DISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.

A STRUCTURE DESIGNED TO CONTROL EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT

THE RIPRAP AND GEOTEXTILE FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP SO THE TOP LAYER IS ABOVE THE DOWNSTREAM LAYER A MINIMUM OF 1 FT. IF THE DAMAGE IS

RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.

EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.

5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.

6. RIPRAP SHALL BE NCDOT RIPRAP CLASS AS SPECIFIED IN THE OUTLET PROTECTION SCHEDULE, OR APPROVED EQUIVALENT. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.

7. CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFILL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.

8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.

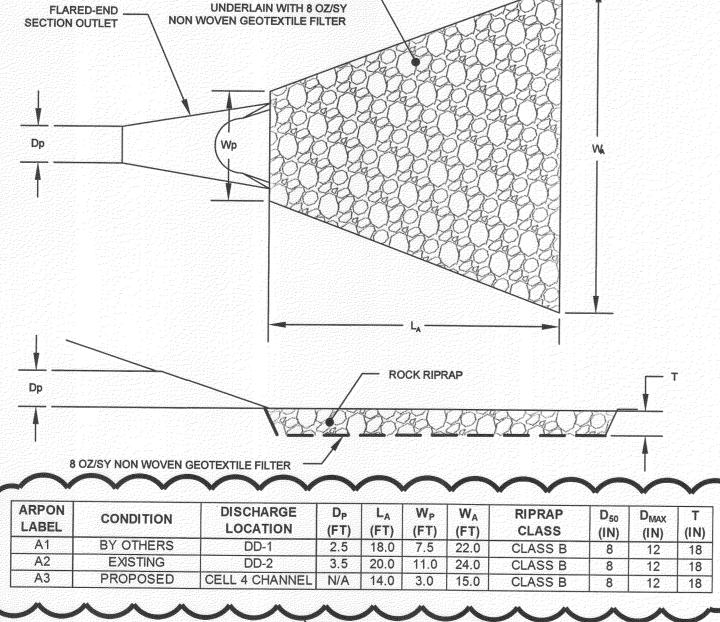
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE:

INSPECT RIPRAP OUTLET STRUCTURES WEEKLY AND AFTER SIGNIFICANT (0.5 INCH OR GREATER) RAINFALL EVENTS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE, OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

# REFERENCE:

6.41.5 NC EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL, 2006



ROCK RIPRAP

# **DEFINITION**

A CHANNEL WITH VEGETATIVE OR PERMANENT LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

# **PURPOSE**

TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION

# CONSTRUCTION SPECIFICATIONS

REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.

7 days for slopes greater than 50' in length

None, except for perimeters and HQW zones

PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE CHANNEL SCHEDULES PLUS A 0.2-FT OVERCUT AROUND THE CHANNEL PERIMETER TO ALLOW FOR BULKING DURING SEEDBED PREPARATIONS AND SOD BUILDUP.

REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE

THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF GRASS SPECIES (SEE GENERAL SEEDING SPECIFICATIONS). PROTECT THE CHANNEL WITH TEMPORARY MATTING SUFFICIENT TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE CHANNEL SCHEDULES).

DURING THE ESTABLISHMENT PERIOD, CHECK CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT, IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL (SEE GENERAL SEEDING SPECIFICATIONS). INSPECT ALL MULCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED, AND REINSTALL MULCH. CONTINUE INSPECTIONS

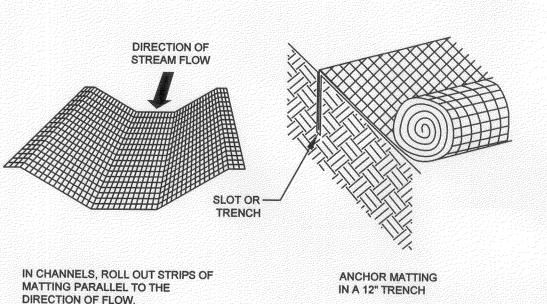
UNTIL VEGETATION IS FIRMLY ESTABLISHED.

CHANNELS ARE TO BE LINED WITH NORTH AMERICAN GREEN MATTING OR RIPRAP AS SPECIFIED IN THE CHANNEL SCHEDULES.

MATTING PRODUCTS SPECIFIED IN THE CHANNEL SCHEDULES SHOULD BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE MATTING DETAIL 2 OF SHEET 5.

8 OZ/SY NON WOVEN GEOTEXTILE FILTER FABRIC SHALL BE PLACED BENEATH RIPRAP AFTER CHANNEL SUBGRADE PREPARATION.





JOIN STRIPS BY

ANCHORING AND

# OVERLAPPING

- 1. CHANNEL DC-2 SHALL BE MATTED WITH NORTH AMERICAN GREEN SC150 OR ENGINEER APPROVED
- 2. APPLY SEED BEFORE LAYING THE NET OR MAT. IF OPEN-WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPRAYED ON AFTERWARD.
- 3. START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES-DO NOT STRETCH.
- 4. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET.

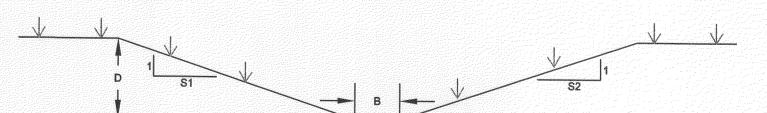
# MAINTENANCE NOTES:

**GENERAL NOTES:** 

- INSPECT ROLLED EROSION CONTROL PRODUCTS (RECP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL IN A 24 HOUR PERIOD AND MAKE ANY NECESSARY REPAIRS IMMEDIATELY.
- 2. GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE
- 3. ANY AREAS OF THE RECP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED 4. IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE
- **ERODED AREA PROTECTED.** 5. MONITOR AND REPAIR THE RECP AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED.

\*REF: 6.17.12 NC Erosion and Sediment Control Planning and Design Manual, 2006





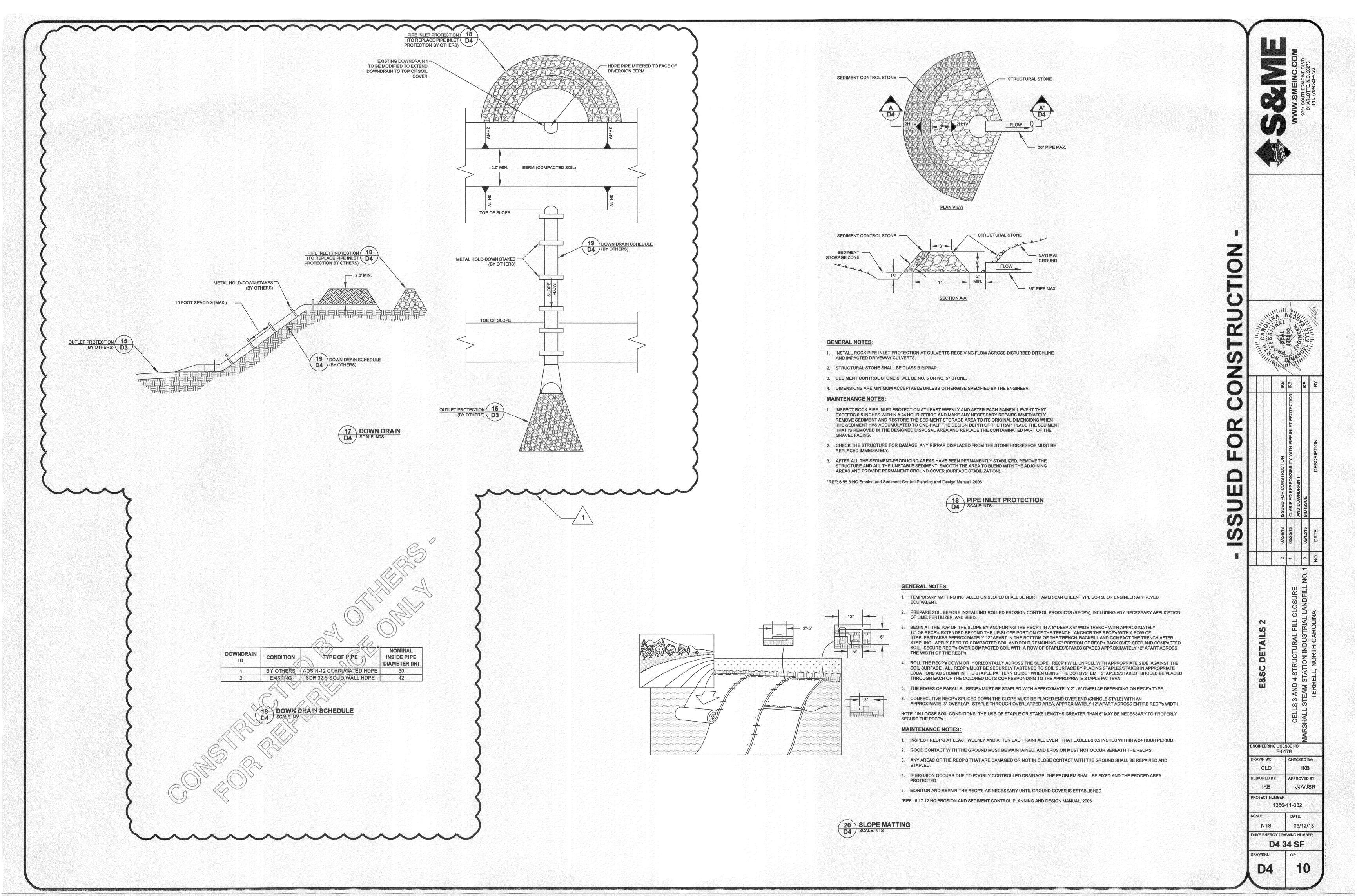
CHANNEL ID	CONDITION	SIDE SLOPES (S1) (H:V)	SIDE SLOPES (S2) (H:V)	BASE WIDTH (FT)		SLOPE (FT/FT)	CHANNEL LINING	CHECK DAM SPACING (FT)
DC-1	ABANDONED	3	3	0	2.00	0.0115	DS75	***************************************
DC-2	PROPOSED	2	3 OR 36	2	4.00	0.0100	SC150	Disposition in comments
TOB-1	BY OTHERS	3	2	0	1,50	0.0200	DS75	
TOB-2	BY OTHERS	3	2	0	1.50	0.0200	DS75	and the second s
OC-1	PROPOSED	3	3	2	2.00	0.0179	CLASS B RIPRAP & 8 OZ/SY NON WOVEN GEOTEXTILE	

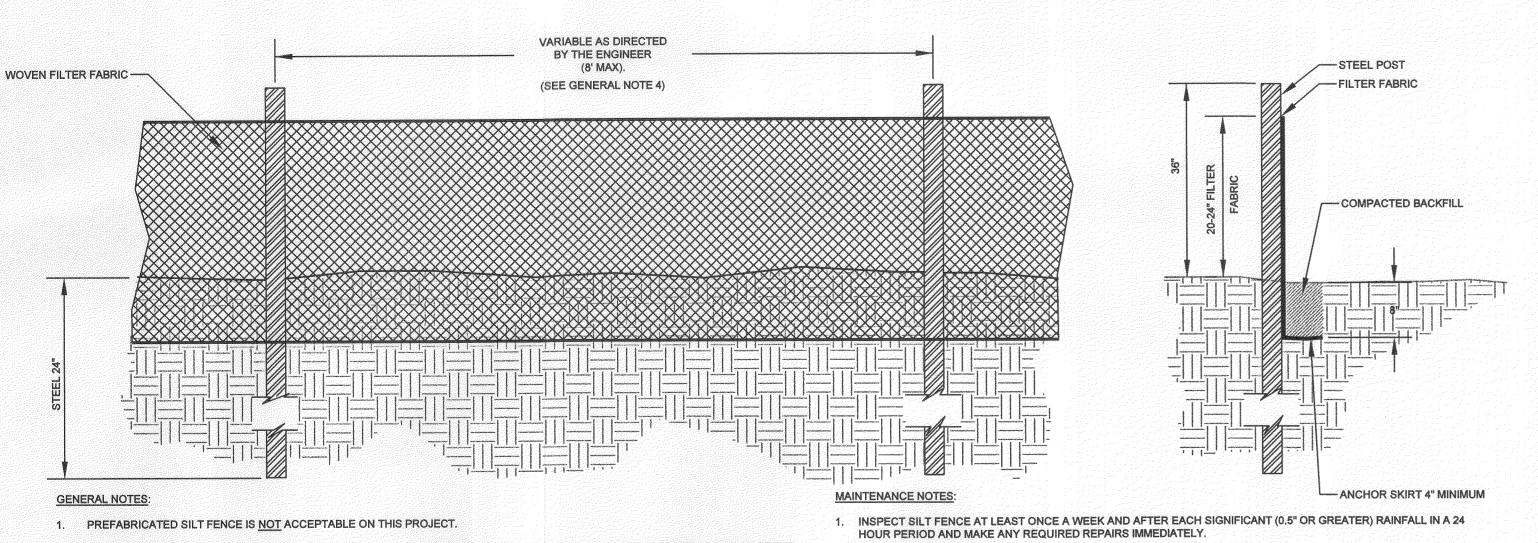


RING LICENSE NO: F-0176 CHECKED BY:

CLD IKB DESIGNED BY IKB JJA/JSR PROJECT NUMBER 1356-11-032 DATE: NTS 06/12/13 DUKE ENERGY DRAWING NUMBER

D3 34 SF





UPSLOPE STAKE

- 2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
- 3. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
- SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC. WHEN FABRIC IS USED WITH WIRE MESH, 8' CENTERED POSTS MAY BE USED. OMISSION OF THE REINFORCING WIRE IS A CONSTRUCTION CHANGE THAT NECESSITATES MORE POSTS FOR SUPPORT (IE. THE SPACING DISTANCE NEEDS TO BE REDUCED TO NO GREATER THAN SIX (6) FEET APART).
- 5. TURN SILT FENCE UP SLOPE AT ENDS.

2" MINIMUM -

TOE IN APPROXIMATELY

2-3" DEEP

6. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE



- WATTLE 12" DIA. MINIMUM

- 2" x 2" x 2' WOOD STAKE



\*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006

- 1. ONLY INSTALL WATTLE(S) TO A HEIGHT IN DITCH SO FLOW WILL NOT WASH AROUND WATTLE AND SCOUR DITCH SLOPES AND AS DIRECTED.
- 2. SPACE WOODEN STAKES 2 FEET O.C. ALONG DITCH SLOPE.

2. SHOULD THE FABRIC OF A SILT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT

3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND

TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.

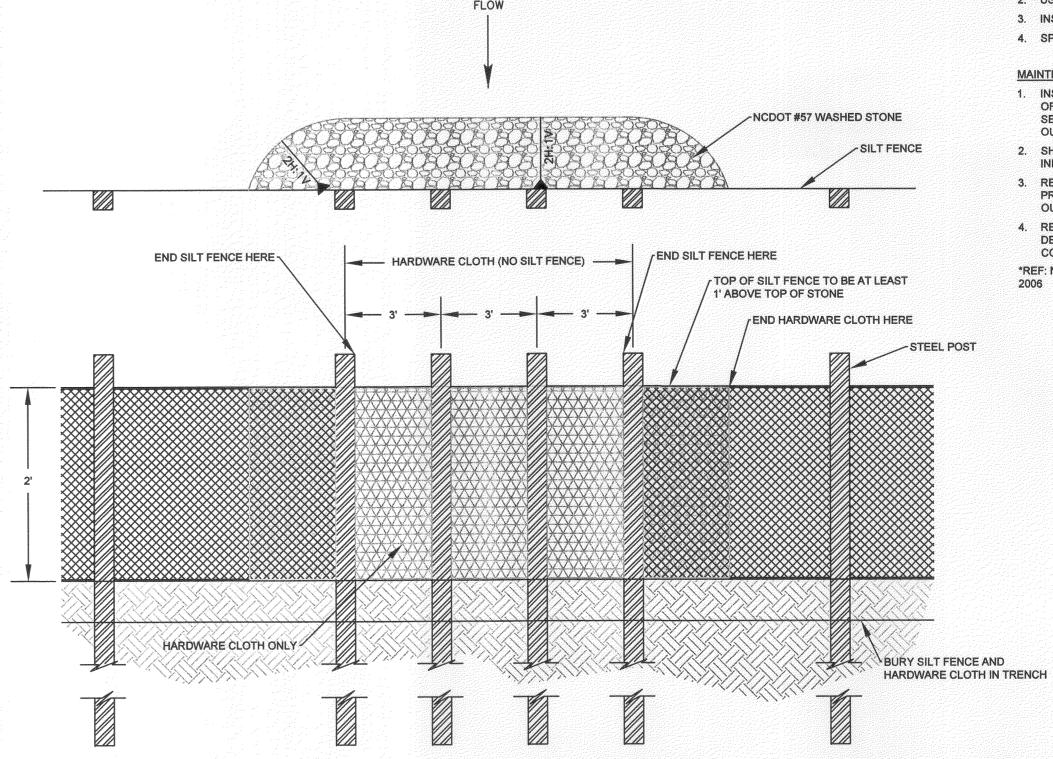
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

- 3. INSTALL A MINIMUM OF 2 UPSLOPE STAKES AND 4 DOWNSLOPE STAKES AT AN ANGLE TO WEDGE WATTLE TO BOTTOM OF DITCH.
- 4. PROVIDE STAPLES MADE 0.125 IN. DIAMETER STEEL WIRE FORMED INTO A U-SHAPE NOT LESS THAN 12" IN LENGTH.
- INSTALL STAPLES APPROXIMATELY EVERY 1 LINEAR FOOT ON BOTH SIDES OF WATTLE AND EACH END TO SECURE IT TO SOIL.

# MAINTENANCE NOTES:

- 1. INSPECT WATTLES AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
- 2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
- 3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
- 4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
- 5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE
- 6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR

\*REF: NCDOT ROADSIDE ENVIRONMENTAL UNIT: SOIL AND WATER SECTION

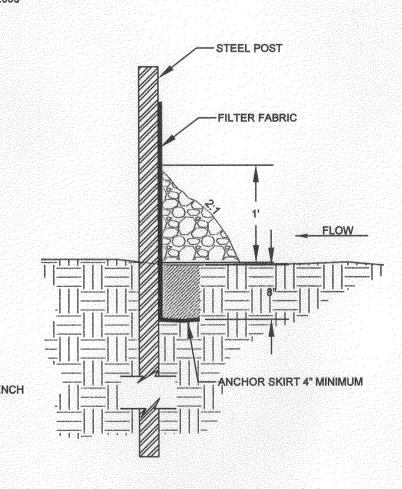


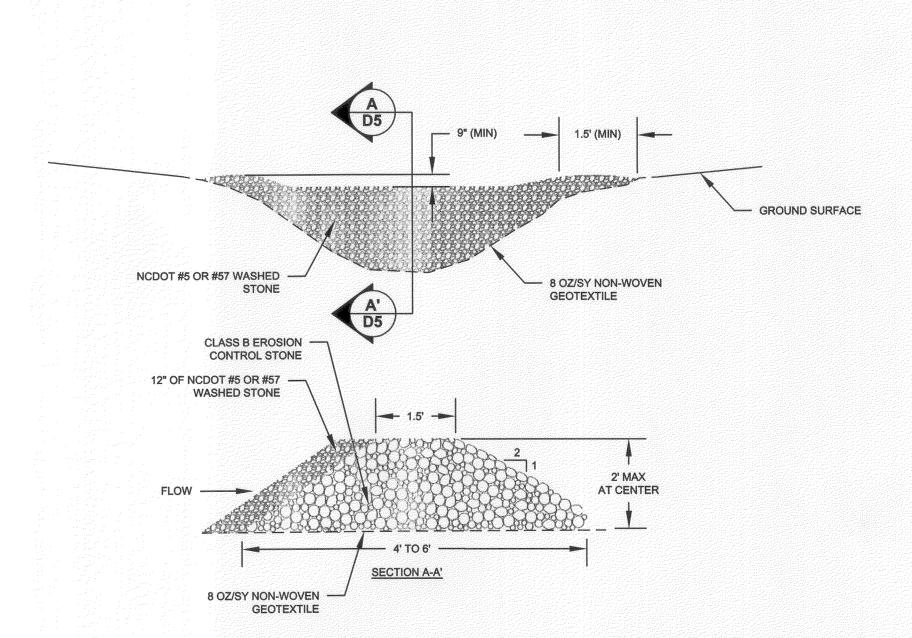
- 1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL
- 2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ½" MESH OPENINGS.
- 3. INSTALL 5' SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
- 4. SPACE POST A MAXIMUM OF 3'.

# MAINTENANCE NOTES:

- 1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
- 2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
- PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
- 4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

\*REF: NC DOT Roadway Standard Detail 1606.01 - Special Sediment Control Fence,





# GENERAL NOTES:

1. STONE SHOULD BE PLACED OVER THE CHANNEL BANKS TO KEEP WATER FROM CUTTING AROUND THE DAM.

# MAINTENANCE NOTES:

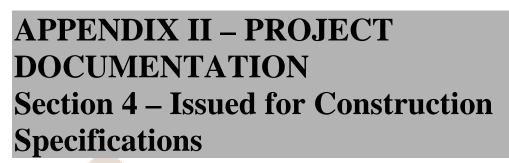
- 1. INSPECT CHECK DAMS AND CHANNELS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL IN A 24 HOUR PERIOD AND MAKE ANY NECESSARY REPAIRS IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE CHANNEL WHEN NEEDED.
- 2. ANTICIPATE SUBMERGENCE AND DEPOSITION ABOVE THE CHECK DAM AND EROSION FROM HIGH FLOWS AROUND THE EDGES OF THE DAM. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN DAMS, ADDITIONAL MEASURES CAN BE TAKEN SUCH AS, INSTALLING A PROTECTIVE RIPRAP LINER IN THAT PORTION OF THE CHANNEL (PRACTICE 6.31, RIPRAP-LINE AND PAVED CHANNELS).
- 3. REMOVE SEDIMENT ACCUMULATED BEHIND THE DAMS AS NEEDED TO PREVENT DAMAGE TO CHANNEL VEGETATION, ALLOW THE CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM, AND PREVENT LARGE FLOWS FROM CARRYING SEDIMENT OVER THE DAM. ADD STONES TO DAMS AS NEEDED TO MAINTAIN DESIGN HEIGHT
- AND CROSS SECTION. \*REF: 6.83.3 NC Erosion and Sediment Control Planning and Design Manual, 2006



F-0176 DESIGNED BY:

CHECKED BY: APPROVED BY: PROJECT NUMBER 1356-11-032

DATE: 06/25/13 DUKE ENERGY DRAWING NUMBER





# TECHNICAL SPECIFICATIONS TABLE OF CONTENTS

# **DIVISION 1 - GENERAL REQUIREMENTS**

01000 General Requirements

# **DIVISION 2 - SITE CONSTRUCTION**

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02230	Site Clearing
02315	Excavation
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02374	<b>Erosion Control Devices</b>
02610	Pipe Culverts
02674	Nonwoven Geotextiles
02924	Seeding and Soil Supplements

# SECTION 01000 GENERAL REQUIREMENTS

#### PART 1 GENERAL

# 1.1 SUMMARY

- A. Section Includes:
  - 1. Summary Work
    - a. Project Summary
    - b. Engineer Responsibilities
    - c. Contractor and Subcontractor Qualifications
    - d. Work Sequence
  - 2. Schedule
    - a. General Requirements
    - b. Schedule
    - c. Meetings
  - 3. Price Payment
    - a. Change Procedures.
    - b. Defect Assessment
    - c. Unit Prices
  - 4. Administrative Requirements
    - a. Submittal Procedures
  - 5. Quality Requirements
    - a. Quality Control and Control of Installation
    - b. Tolerances
    - c. Testing and Observation Requirements
  - 6. Temporary Facility Controls
    - a. Temporary Controls
    - b. Temporary Facilities
    - c. Site Security
  - 7. Product Requirements
    - a. Product Substitution Procedures
  - 8. Execution Requirements
    - a. Closeout Procedures
    - b. Project Record Documents

# PART 2 SUMMARY WORK

#### 2.1 PROJECT SUMMARY

- A. The scope of work is defined in Exhibit B, Section 01010.
- B. Optional work items for construction are identified on the Bid Worksheet

- Perform Work of Contract under stipulated sum with Owner in accordance with Conditions of Contract.
- D. Work of Contract shall be constructed to the lines and elevations as shown on the Drawings and as identified in these Technical Specifications. Any deviations from the Drawings or Technical Specifications require the prior written approval of the ENGINEER and must be documented by "record" revisions to the Drawings and/or Technical Specifications.
- E. During phases of construction, construction will be tested, monitored, and evaluated prior to approval.

#### 2.2 ENGINEER RESPONSIBILITIES

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth as follows and will not be changed without written consent of Owner and Engineer.
  - 1. Neither Engineer's authority or responsibility under this Section or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
  - 2. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
  - Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work
  - 4. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by the Contract Documents will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
  - 5. The limitations upon authority and responsibility set forth in this Section shall also apply to the Resident Project Representative, if any, and assistants, if any.

#### 2.3 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

- A. General Contractor (Contractor AND Subcontractor):
  - The Contractor AND Subcontractor must be qualified and experienced in construction work and must complete and must submit qualifications as required by the Bid Instructions.

#### B. Surveyor:

1. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

## 2.4 WORK SEQUENCE

- A. General Order of Construction. During and prior to construction period, coordinate construction schedule and operations with Owner, Engineer, and any other applicable parties.
- B. The work sequence shall generally follow the work description summarized in Exhibit B, Section 01010, and shall be consistent with the work sequences identified in the Erosion and Sediment Control Plan and permit.

#### PART 3 SCHEDULE

## 3.1 GENERAL REQUIREMENTS

- A. The platform for this schedule shall be in an electronic format agreeable to the Owner.
- B. Specific schedule format shall include activities, start date, finish date, duration, activity logic (predecessor and successor activities), percent progress, and milestones.
- C. The Contractor shall only be permitted to work during daylight hours, but not more than 10 hours per day. The Contractor shall not be permitted to work more than 6 work days in a calendar week. The Contractor may seek exceptions to these work hours with Duke Energy authorization.
- D. The schedule calendar shall be depicted with defined work hours i.e. 4 10's, 5 10's, etc.
- E. Bidders shall submit a proposed project schedule with their bids and the successful Bidder shall submit a final project schedule within 15 days of award.

#### 3.2 SCHEDULE

- A. It is suggested that the schedule include at a minimum those items described in the scope of work in Exhibit B, Section 01010.
- B. The schedule shall include but not be limited to the following milestones:
  - 1. Mobilization and Personnel Training
  - 2. Finished Soil Cover
  - 3. Finished Topsoil Cover
  - 4. Project Substantial Completion
  - 5. Demobilization
  - 6. Completion Acceptance
- C. During construction, the schedule shall be updated on a bi-weekly basis and as otherwise requested by the Owner.

# 3.3 MEETINGS

- A. The successful bidder shall allow and plan for the following meetings in the project schedule:
  - 1. Regular weekly construction progress meetings with the Owner.

#### PART 4 PRICE PAYMENT

#### 4.1 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time.
- C. The Engineer may issue a Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within three days.
- D. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Part 7 of this Specification.
- E. Work Directive Change: Engineer may issue directive instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

#### 4.2 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer and/or Owner, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- D. Authority of Engineer and/or Owner to assess defects and identify payment adjustments is final.
- E. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.
  - 3. Products not completely unloaded from transporting vehicle.
  - 4. Products placed beyond lines and levels of required Work.
  - 5. Products remaining on hand after completion of the Work.
  - 6. Loading, hauling, and disposing of rejected products.

#### 4.3 UNIT PRICES

# A. Unit Quantities

- Measurement methods delineated in individual specification sections complement criteria
  of this section. In event of conflict, requirements of individual specification section
  govern.
- 2. Take measurements and compute quantities. Engineer will verify measurements and quantities.

- 3. Quantities and measurements indicated in Bid Form and/or Contract Documents are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
  - a. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit prices contracted.
  - b. When actual Work requires 30 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.

#### B. Unit Prices

- 1. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
- 2. Specific Item Unit Pricing is delineated in the individual specification sections.
- 3. Mobilization
  - a. Basis of Measurement: By lump sum.
  - b. Basis of Payment: Includes mobilization for the project.

#### PART 5 ADMINISTRATIVE REQUIREMENTS

#### 5.1 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor and Supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.
- F. When revised for resubmission, identify changes made since previous submission.
- G. Submittals not requested will not be recognized or processed.

#### PART 6 OUALITY REQUIREMENTS

#### 6.1 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' and/or supplier's instructions, including each step in sequence.

- C. When manufacturers' and/or supplier's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce specified quality.
- F. Verify field measurements are as indicated on Construction Drawings or as instructed by manufacturer.
- G. Materials stored off the site shall be stored in accordance with Manufacturer recommendations and stored in a bonded warehouse and shall be clearly marked as being for this project.

# 6.2 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### 6.3 TESTING AND OBSERVATION REQUIREMENTS

- A. Testing and observation services for the purpose of conducting tests shall be performed by the Engineer as required by the technical specifications. All costs of testing shall be paid by the Owner. The entity providing the testing and observation services shall be referred to as the construction quality assurance (CQA) agent herein.
- B. Testing, observations and source quality control may occur on or off project site. Perform off-site testing as required by Engineer or Owner.
- C. Cooperate with CQA agent; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. The Contractor shall give ample advance notice to the CQA agent and Engineer prior to expected time for operations requiring testing services and/or before covering up items that require inspection.
  - 2. Make arrangements with CQA agent and pay for additional samples and tests required for Contractor's use.
- D. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- E. Re-testing or observation required because of non-conformance to specified requirements shall be performed by same CQA agent on instructions by Engineer. Payment for re-testing will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- F. CQA Agent Responsibilities:
  - 1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
  - Perform specified sampling and testing of products in accordance with specified standards.

- 3. Ascertain compliance of materials with requirements of Contract Documents.
- 4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
- 5. Perform additional tests required by Engineer.
- 6. Attend preconstruction meetings and progress meetings.

# PART 7 TEMPORARY FACILITY CONTROLS

#### 7.1 TEMPORARY CONTROLS

#### A. Barriers

Provide barriers to prevent unauthorized entry to construction areas and to protect
existing facilities and adjacent properties from damage from construction operations and
demolition.

#### B. Water Control

- 1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- Provide water barriers as required to protect site from soil erosion according to project's Erosion and Sedimentation Control Plan.

#### C. Dust Control

- 1. Execute Work by methods to minimize raising dust from construction operations.
- 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- 3. The Contractor shall follow the approved Dust Control Plan for the existing Cells 1 and 2 as directed by Duke Energy.

#### D. Erosion and Sediment Control

- 1. Follow project's Erosion and Sedimentation Control Plan.
- 2. Perform an inspection 10 months after Substantial Completion (or when ground stabilization is sufficient) with the Owner and NCDENR Land Quality Section to close the Erosion and Sedimentation Control Plan. The Contractor shall remove temporary E&SC measures and/or make any necessary repairs resulting from the E&SC inspection.
- 3. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- 4. Minimize surface area of bare soil exposed at one time.
- 5. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow across disturbed areas.
- 6. Construct fill and waste areas by selective placement to avoid erosive surface.
- 7. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- 8. Optional item: Performing post- construction inspections at least weekly and after each 0.5-inch or greater rainfall event, as well as making any necessary repairs resulting from the inspections.

#### 7.2 TEMPORARY FACILITIES

A. Contractor shall provide portable toilet and hand-wash facilities for their employees and subcontractors in accordance with OSHA's per-person ratio, at no additional expense to the owner (price to be included in the base bid). Toilets will be serviced and maintained such that no sustained nuisance odors come from them.

#### 7.3 SITE SECURITY

A. The Contractor is responsible for securing the work area, equipment, and materials. Owner will not be responsible for vandalism, damage, or theft of equipment and materials on the job site.

## PART 8 PRODUCT REQUIREMENTS

#### 8.1 PRODUCT SUBSTITUTION PROCEDURES

- A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  - 2. Will provide same warranty for Substitution as for specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner and/or Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.
- F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- G. Substitution Submittal Procedure:
  - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
  - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

#### PART 9 EXECUTION REQUIREMENTS

## 9.1 CLOSEOUT PROCEDURES

- A. Final Application for Payment shall be accompanied by the following documents:
  - 1. Guarantees of all materials and workmanship.
  - 2. Contractor's Affidavit, Release and Waiver of Claims.
  - 3. Consent of Surety (if applicable).

- Marshall Steam Station Industrial Landfill No. 1 Cells 3 and 4 Structural Fill Closure
  - 4. Final State/County Sales/Use Tax Statement (if applicable).
  - Complete list of all Subcontractors and areas of work performed.
  - 6. Proof of Compliance with Building Standards.
  - 7. MWBE Documentation of Final Contract Payments (if applicable).
  - 8. Warranties as described in Exhibit I.

#### 9.2 PROJECT RECORD DOCUMENTS

- Maintain on site one set of the following record documents; record actual revisions to the Work: A.
  - Drawings.
  - 2. Specifications.
  - 3. Approved Erosion and Sediment Control Plan.
  - 4. Addenda.
  - 5. Change Orders and other modifications to the Contract.
  - 6. Reviewed Shop Drawings, Product Data, and Samples.
  - 7. Manufacturer's instruction for assembly, installation, and adjusting.
- Ensure entries are complete and accurate, enabling future reference by Owner. B.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly. For each item, include percentage of work complete versus percentage of work invoiced.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - Manufacturer's name and product model and number. 1.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Certified by a Professional Land Surveyor licensed in the state of North Carolina. Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - Details not on original Contract drawings. 5.
- G. Submit documents to Engineer.

END OF SECTION

## SECTION 02060 AGGREGATE

#### PART 1 GENERAL

# 1.1 SUMMARY

#### A. Section Includes:

- 1. Aggregate Type A1 No. 57 stone for drainage aggregate and erosion and sediment control structures.
- 2. Aggregate Type A2 Class B riprap for erosion and sediment control structures.

#### B. Related Sections:

1. Section 02374 – Erosion Control Devices

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

## A. Coarse and Fine Aggregate:

- 1. Basis of Measurement: Included with Section 02374.
- 2. Basis of Payment: Included with Section 02374.

#### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T11 Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
  - 2. AASHTO T27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
  - 3. AASHTO T180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop (as modified by NCDOT).

## B. ASTM International:

- 1. ASTM C33 Standard Specification for Construction Aggregates
- 2. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
- 3. ASTM D421 Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
- 4. ASTM D422 Standard Test Method for Particle Size Analysis of Soils.
- 5. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- 6. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- 7. ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18 inch Drop.
- 8. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- 9. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- 10. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- 11. ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- 12. ASTM D4254 Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

C. North Carolina Department of Transportation (NCDOT) Standard specifications for Roads and Structures.

#### 1.4 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers and description of material.
- B. Manufacturer's/Supplier's Certificate: Certify materials meet or exceed specified requirements.
- C. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer.

# 1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material type from single source throughout the Work.
- B. Perform Work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures or as otherwise specified.

#### **PART 2 PRODUCTS**

#### 2.1. FINE AND COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1 Drainage Aggregate: Subangular, subrounded, rounded, or well rounded particle shaped conforming to No. 57 Stone NCDOT Standards. Coarse Aggregate Type A1 shall be used in the pipe inlet protection as shown on the Drawings.
- B. Coarse Aggregate Type A2: Conforming to Class B Riprap NCDOT standards. Coarse aggregate Type A2 shall be used for drainage feature outlet protection, and pipe inlet protection as shown on the Drawings.

# 2.2 SOURCE QUALITY CONTROL

- A. Aggregate Material Testing and Analysis: Perform in accordance with ASTM C33, ASTM C136, ASTM D421, ASTM D422, ASTM D4253, ASTM D4254, AASHTO T11, and/or AASHTO T27.
- B. When tests indicate materials do not meet specified requirements, change material or material source and retest.
- C. Furnish materials of each type from same source throughout the Work.

#### PART 3 EXECUTION

# 3.1. STOCKPILING

- A. Stockpile materials on site at locations agreed upon by Engineer and Owner.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

#### 3.2. STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water and restore to original site conditions.

# 3.3. EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

#### 3.4. PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

#### 3.5. AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to a total compacted thickness as specified on Drawings.
- B. Place aggregate in a maximum layer and compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

# 3.6. TOLERANCES

- A. Scheduled Compacted Thickness: Within ¼ inch.
- B. Variation From Design Elevation: Within ½ inch.

# 3.7. FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D698, AASHTO T180 (as modified by NCDOT), ASTM D2167, ASTM D2922, and/or ASTM D3017.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

# END OF SECTION

# SECTION 02230 SITE CLEARING

#### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Site Clearing and Grubbing.
  - 2. Stripping/Topsoil Excavation.
- B. Related Sections:
  - 1. Section 02374 Erosion Control Devices.

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Site Clearing and Grubbing:
  - Basis of Measurement: By the 2-dimensional acre of the original ground surface that is cleared and grubbed. Computation of the quantities of clearing and grubbing will be based on surveyed surface areas (provided by the Contractor) cleared and grubbed and will be mutually agreed to in writing by the Engineer and Contractor for each particular area.
  - 2. Basis of Payment: By the 2-dimensional acre times unit price per acre for clearing and grubbing.
    - a. Includes clearing and grubbing site and burning waste materials on-site (if local permit conditions at the time allow).
    - Optional bid item: includes clearing and grubbing site, loading, hauling, and removing waste materials from site.
- B. Stripping / Topsoil Excavation:
  - 1. Basis of Measurement: By the 2-dimensional acre of the original ground surface that is excavated of topsoil. Computation of the quantities of topsoil excavation will be based on surveyed surface areas (provided by the Contractor) excavated of topsoil and will be mutually agreed to in writing by the Engineer and Contractor for each particular area.
  - 2. Basis of Payment: Made at contract price per 2-dimensional acre for stripping/topsoil excavation.
    - a. Includes removal, loading, hauling, and either stockpiling material approved by the Engineer for re-use as topsoil at the designated on-site stockpile location, or removing waste materials not approved by the Engineer for re-use as topsoil from site (unless permitted to dispose of on site by Owner).

#### 1.3 SUBMITTALS

#### A. N/A

# 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State and local standards and ordinances.
- B. Conform to applicable codes for environmental requirements, disposal of debris, and burning debris on site (if allowed by OWNER).

#### **PART 2 PRODUCTS**

#### 2.1 MATERIALS

A. N/A

#### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify topsoil stockpile area and waste area for materials not approved for re-use as topsoil. May dispose on site if permitted by Owner in Owner designated area.

#### 3.2 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

#### 3.3 PROTECTION

- A. Locate, identify, and protect from damage utilities indicated to remain.
- B. Protect trees, plant growth, and features designated to remain as final landscaping as specified on Drawings.
- C. Protect bench marks, survey control points, groundwater monitoring wells, and existing structures from damage or displacement.

## 3.4 SITE CLEARING AND GRUBBING

- A. Notify Engineer prior to commencing with clearing activities.
- B. Install erosion control devices as shown on the Drawings and as specified in Section 02374 Erosion Control Devices.
- C. Clear areas required for access to site and execution of Work.
- D. Remove trees and shrubs within construction area. Remove all trash or debris. Remove all materials to a depth necessary to eliminate soils containing more than 5 percent by weight fibrous organic matter, rubbish, vegetable matter, small stones, stumps, roots, root system, or other objectionable deleterious material within the clearing limits.
- E. Clear undergrowth and deadwood.
- F. Allow inspection of cleared areas by Engineer or his representative prior to beginning other construction activities.

## 3.5 REMOVAL

- A. Remove debris, rock, and extracted vegetation from site. If permitted by Owner, may dispose of on-site in Owner specified location.
- B. Remove construction debris and other materials that can not be used in earthwork construction or final vegetation. Materials shall be disposed off-site unless permitted by Owner to dispose of on-site in Owner designated location.
- C. Do not burn or bury materials on-site unless permitted by State and local ordinances and laws and given permission by Owner to do so. Leave site in clean condition.

### 3.6 STRIPPING/TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, or re-graded without mixing with foreign materials for use in finish grading. The minimum topsoil stripping depth shall be twelve inches or as determined by the Engineer.
- B. Stockpile material at the designated on-site stockpile location and protect from erosion.
- C. Remove excess topsoil not intended for reuse, from site unless permitted by owner to dispose of onsite in Owner designated location.

# SECTION 02315 EXCAVATION

### PART 1 GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating Unsuitable Material (Undercut).
- B. Related Sections:
  - 1. Section 02230 Site Clearing.
  - 2. Section 02320 Backfill Structural.
  - 3. Section 02374 Erosion Control Devices.

# 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Excavating Unsuitable Material (Undercut):
  - 1. Basis of Measurement: By the cubic yard.
    - a. The quantity of undercutting will be based upon survey information collected before and after the undercut. See Part 1.2 A.2.a above.
    - b. In the case of small volume areas of undercutting, it will be acceptable to use an average depth times area volume computation, if both the Contractor and Owner agree prior to measurement.
       Both the Contractor and Owner or his designee should be represented when average depth measurements are made.
    - c. Unsuitable materials shall be removed to the satisfaction of the Engineer.
  - 2. Basis of Payment: By the cubic yard of undercut times the unit price for undercut.
    - a. Includes excavating to required elevations, and any and all necessary de-watering during excavation.
    - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

# 1.3 SUBMITTALS

A. N/A.

## PART 2 PRODUCTS

2.1 N/A.

## PART 3 EXECUTION

# 3.1 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
  - 1. Have the underground utilities to be located and marked within and surrounding construction areas.

- B. The Contractor shall protect all existing facilities, including, but not limited to existing electrical lines and poles, and monitoring wells during excavations and stockpiling. Damaged facilities shall be promptly replaced at the Contractor's expense.
- C. Notify utility company to remove and relocate any utilities.
- D. Perform site clearing, grubbing, rotary mowing, necessary surveys, and topsoil excavation per Section 02230 – Site Clearing. Any depths of removal of twelve inches or less shall be considered Site Clearing and Grubbing.
- E. Identify required lines, levels, contours, and datum locations.
- F. Protect bench marks, survey control points, and existing structures from excavating equipment and vehicular traffic.

## 3.2 EXCAVATION

- A. Install erosion control measures as specified on the Drawings.
- B. Remove lumped subsoil, boulders, and rock.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- D. Materials determined unsuitable by the Engineer shall be excavated from a depth of 12 inches below the existing ground surface within the area, the area 10 feet beyond the area and any other area designated by the Engineer. (Depths of removal of 12 inches or less in areas designated above shall be considered stripping.) The lateral extent and required depth of undercutting will be determined by the Engineer.
- E. Excavated unsuitable areas shall be replaced with structural fill, lean concrete, or aggregate as recommended by the Engineer.
- F. If necessary, the area of excavation/undercutting shall be dewatered to a depth of at least two feet below the bottom of the excavation and shall be maintained in the dewatered condition until compacted earth fill is placed to at least three feet above the original water level or to original ground level, whichever is higher.
- G. Perform temporary dewatering as necessary during excavation to minimize softening of exposed subgrade soils. A temporary sump may be constructed for accumulation of impounded waters resulting from rain or seepage. A pump with adequate capacity shall be provided and operated to <u>maintain</u> a low water level in the sump.
- H. Correct over-excavated areas with select backfill and compact replacement as specified for authorized excavation per Section 02320 Backfill Structural. No payment will be made for over-excavation or corrections made to over-excavated areas.
- All reconditioning of structural fill to obtain the required compaction will be the responsibility of the Contractor.
- J. Furnish all labor, materials, supervision, and equipment required for constructing and maintaining temporary diversion measures as required for construction of the landfill and all structures. Furnish, install, maintain, and operate all pumping equipment for diversion or removal of water and maintaining the work area free from water throughout construction including temporary ditches and sump construction.

- K. Protect and or divert stormwater flows from the work area utilizing Stormwater and Erosion Control Structures referenced in Section 02374.
- L. Provide survey information before and after excavation.

# 3.3 FIELD QUALITY CONTROL

A. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.

## 3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath structures from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, stormwater, groundwater and other hazards created by earth operations.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Protect outlet of excavations from potential sediment deposit by placing sediment control measures such as silt fence and/or temporary sediment traps.

# SECTION 02320 BACKFILL - STRUCTURAL

#### PART 1 GENERAL

# 1.1 SUMMARY

### A. Section Includes:

- 1. Fill Type S1, structural fill, defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier. Any fill material containing ash will not be considered as Fill Type S1.
- 2. Fill Type S2, subgrade fill, defined as compacted fill placed to achieve proposed liner system subgrade elevations. Fill Type S2 may include fill material containing ash.
- 3. Fill Type S5, topsoil/vegetative soil, defined as soil material capable of sustaining vegetation as specified in these Specifications.
- 4. Dust Control

## B. Related Sections:

Not Used.

### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

## A. Fill Type S1, Structural Fill:

- 1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled, the quantity of structural fill will be based upon the in-place volume between the excavated surface or prepared subgrade and the structurally filled surface as determined by the difference between two topographic surveys. A grid pattern as approved by the Engineer of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall check the as-built finished grades and determine the backfilled volume of ash based on survey data provided by the Earthwork Contractor. Survey for measurement and payment shall be performed by a licensed professional land surveyor, independent of the Contractor.
- 2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S1 placement.
  - a. Includes borrow excavation, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
  - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Earthwork Contractor, at his expense, will uncover any buried or covered material for re-evaluation by the Owner or Engineer.

# B. Fill Type S2, Subgrade Fill:

1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled, the quantity of structural fill will be based upon the in-place volume between the excavated surface or prepared subgrade and the structurally filled surface as determined by the difference between two topographic surveys. A grid pattern as approved by the Engineer of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall

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check the as-built finished grades and determine the backfilled volume of ash based on survey data provided by the Contractor. Survey for measurement and payment shall be performed by a licensed professional land surveyor, independent of the Contractor.

- 2. Basis of Payment: by the cubic yard placed times the unit price for fill Type S2 placement.
  - a. For ash includes excavation and removal from active ash basin and/or reshaping of existing grade, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
  - b. For natural soil materials includes borrow area excavation and removal, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
  - c. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for reevaluation by the Owner or Engineer.

# C. Fill Type S5, Topsoil:

- 1. Basis of Measurement: By the cubic yard filled or as otherwise agreed to by the Owner and Contractor. For the cubic yard filled as determined by the difference between the Subgrade Survey and the As-Built Survey.
- 2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S5 placement.
  - a. Includes borrow excavation and/or furnishing, hauling, scraping, scarifying fill material, placing, compacting, and maintenance of topsoil.
  - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for reevaluation by the Owner or Engineer.

#### D. Dust Control:

- 1. Basis of Measurement: Lump sum.
- 2. Basis of Payment: Lump sum.
  - a. Includes labor and materials for performance of providing dust control to meet the requirements of the approved Dust Control Plan for the existing Cells 1 and 2 as directed by Duke Energy.

## 1.3 REFERENCES

- A. ASTM D422 Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).
- B. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).
- C. ASTM D1556 Standard Test Method for Density of Soil In Place by the Sand-Cone Method.
- D. ASTM D2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- E. ASTM D2922 Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

- F. ASTM D2487 Standard Practices for Classification of Soil for Engineering Purposes (Unified Soil Classification System)
- G. ASTM D2937 Standard Test Method for Density of Soil in place by the Drive-Cylinder Method.
- H. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

### 1.4 SUBMITTALS

Not Used.

## PART 2 PRODUCTS

### 2.1 FILL MATERIALS

## A. Fill Type S1, Structural Fill:

- 1. Structural fill is defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier.
- Natural soil material from designated on-site borrow areas and/or stockpiles. Any fill
  material containing ash shall not be considered as Type S1 Fill
- 3. Structural fill shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
- 4. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 4 inches, subsoil, debris, vegetation, and other foreign matter.
- 5. Structural fill located within 1-foot of geosynthetics components shall have a maximum particle size of 3 inches. The material shall be screened by the Earthwork Contractor, if necessary, to remove particle sizes greater than 3 inches in diameter. No more than 5 percent of the material should be retained on the No. 4 sieve.
- 6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.

## B. Fill Type S2, Subgrade Fill:

- 1. Subgrade fill is defined as compacted fill placed to achieve proposed liner system subgrade elevations.
- 2. May consist of fly ash from Marshall Steam Station, or other on-site sources as directed by the Engineer.
- 3. May consist of natural soil material from designated on-site borrow areas and/or stockpiles.
- 4. Shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
- 5. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 4 inches, subsoil, debris, vegetation, and other foreign matter.
- 6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clay clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.

# C. Fill Type S5, Topsoil/Vegetative Soil:

1. Topsoil / vegetative soil is defined as compacted fill placed to achieve final grades on the final cover system or to otherwise support vegetation establishment in areas not within the landfill cells.

- 2. Excavated and reused materials from designated on-site or off-site borrow areas and/or stockpiles and/or approved soil from trenching operations.
- 3. Shall be classified as SM, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
- 4. Free of roots, stumps, brush, debris, and other foreign matter.
- 5. Shall have no rocks protruding from topsoil surface.
- 6. Topsoil material shall have nutrient content and pH capable of supporting vegetation.
- 7. Shall have a minimum organic contact of 2% by weight.
- 8. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 2 inches in diameter with no more than 15% retained on the No. 4 sieve.

### PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01300 Administrative Requirements: Coordination and project conditions
- B. The Engineer will assist the Earthwork Contractor in the determination of Structural Fill and non-select material during excavation operations (see Section 02315). The Earthwork Contractor will be responsible for excavating, transporting, stockpiling, placing and compacting all materials as needed.

#### 3.2 PREPARATION

- A. Prepare and compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas, scarify and moisture condition, or modify areas of subgrade not capable of compaction in place as recommended by the Engineer or his representative. Backfill with Type S1 or S2 fill (as specified by the Engineer) and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inches.
- D. Proof roll subgrade to identify soft spots requiring removal or modification. Place fill and compact to density equal to or greater than requirements, and within moisture range required, for subsequent fill material.
- E. Begin backfilling after acceptance of the Stripped Surface Survey.

## 3.3 BACKFILLING

- A. Backfill areas to contours and elevations as shown on Drawings with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Fill Type S1 and S2 Soil Materials: Place and compact material in loose lifts not exceeding 8 inches in thickness and not exceeding 6 inches compacted thickness. Manually compacted fill near pipes and other structures will be placed in loose lifts not exceeding 4 to 6 inches in thickness.
- D. Fill Type S2- Subgrade Fill Ash: Place and compact material in loose lifts to achieve 12-inch compacted lift thickness.

- E. Fill Type S5: Scarify subgrade, place material in one or more lifts and track in with backhoe or other equipment approved by Engineer.
- F. Fill Type S1, backfill for drop inlets, and culverts:
  - 1. Backfill of the drop inlets and culverts shall be placed and compacted in 4 to 6 inch thick loose lifts around the drop inlets and over the culverts. Lift thickness shall be maintained for fill placed within the initial 2-ft over the culverts.
  - 2. Compaction shall be performed by hand tampers or small hand operated compactors.
- G. Employ placement method that does not disturb or damage other work.
- H. Backfill against supported structures. Do not backfill against unsupported structures.
- I. Backfill simultaneously on each side of unsupported structures until supports are in place.
- J. Protect backfill from desiccation, crusting, or cracking.
- K. Make gradual grade changes. Blend slope into level areas.
- L. Remove surplus backfill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.
- M. Leave fill material stockpile areas free of excess fill materials.
- N. Provide positive drainage in on-site borrow areas and/or stockpiles.
- O. Throughout construction, provide the necessary dust control measures to meet the requirements of the approved Dust Control Plan for the existing Cells 1 and 2.
- P. Perform Subgrade Survey before placement of overlying materials.

# 3.4 TOLERANCES

- A. Section 01400 Quality Requirements: Tolerances.
- B. Finished grade for Type S1 fill shall be plus or minus 1 inch from required elevations. Finished grade for Type S2 soil materials fill shall be -1 to plus 0 inches.
- C. Finished grade for Type S2- subgrade fill ash shall be placed to plus or minus 3 inches of proposed grades as indicated on subgrade drawings.

## 3.5 FIELD QUALITY CONTROL

- A. The Owner's representative shall be responsible for field quality control of structural fill placement
- B. Laboratory Testing Soil Materials
  - Perform laboratory material tests in accordance with ASTM D422, ASTM D698, ASTM D2216, and ASTM D4318.
  - 2. Fill Type S2 Subgrade Fill Ash: test at a frequency of:
    - a. 20,000 cubic yards of material placed;
    - b. When materials using for structural fill change; and/or
    - c. when directed by the Engineer.
    - d. Sample size shall be 50-lb.
  - 3. Fill Type S1 and S2 Soil Materials test at a frequency of:

- a. 10,000 cubic yards of material placed;
- b. When materials used for structural fill change; and/or
- c. when directed by the Engineer.
- d. Sample size shall be 50-lb.
- C. In Place Compaction and Natural Moisture Content Tests
  - Perform in-place compaction tests in accordance with ASTM D1556, ASTM D2922, or ASTM D2937.
  - 2. Perform in-place natural moisture content test in accordance with ASTM D2216.
  - 3. Fill Type S2 Subgrade Fill Ash: frequency of compaction/natural moisture content tests for landfill subgrade at a minimum frequency of 1 test per 5,000 in-place cubic yards (approximately 1 test per 3 acres per lift) or as otherwise indicated in these Specifications.
  - 4. Frequency of compaction/natural moisture content tests:
    - a. Area fills outside landfill cells, surface water control systems, or other systems not intended to function as a migration barrier, in-place density and moisture: Each lift at a minimum frequency of 1 per acre per lift, or as otherwise indicated in these Specifications.
    - b. Perimeter berms and roadways: Each lift at a minimum frequency of 1 per 5000 sq. ft.
    - c. Pipe backfill: Each lift at a minimum frequency of 1 per 50 linear feet.
  - 5. Landfill and Embankments:
    - a. Type S1 and S2 fill shall be compacted to minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
    - b. Fill Type S5 should be placed in one continuous loose lift and tracked in by backhoe or other equipment approved by Engineer.
    - c. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
  - 6. Drop Inlets, and Culverts:
    - a. Compaction shall be at a minimum 95 percent of the Standard Proctor maximum dry density.
    - b. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

# 3.6 PROTECTION OF FINISHED WORK

- A. Section 01700 Execution Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic.

**END OF SECTION** 

02320 - 6 Backfill - Structural

# SECTION 02374 EROSION CONTROL DEVICES

### PART 1 GENERAL

## 1.1 SUMMARY

### A. Section Includes:

- 1. Channels.
- 2. Downdrains.
- 3. Rock Pipe Inlet Protection.
- 4. Outlet Protection.
- 5. Silt Fencing.
- 6. Silt Fence Outlets.
- 7. Check Dam.
- 8. Straw Wattle.
- 9. Slope Matting.
- 10. Grassing.
- 11. Erosion Maintenance.
- 12. Erosion Closeout
- 13. Post-Construction Erosion Inspections and Repair

## B. Related Sections:

- 1. Section 02060 Aggregate.
- 2. Section 02230 Site Clearing.
- 3. Section 02320 Backfill Structural.
- 4. Section 02610 Pipe Culverts.
- 5. Section 02674 Nonwoven Geotextile.
- 6. Section 02924 Seeding and Soil Supplements.

### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

## A. Channels:

- 1. Basis of Measurement: By linear foot.
- 2. Basis of Payment: Linear footage installed times the unit price per linear foot.
  - a. Includes excavating, windrowing, placing fill, compacting, installing channel lining (erosion control matting or riprap and non-woven geotextile), maintaining during construction, seeding, and mulching for grass-lined channels as indicated on Drawings, and maintaining during construction. Refer to Section 02924 for seeding and soil supplements for grassing.
  - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for reevaluation.

### B. Downdrains:

- 1. Basis of Measurement: By linear foot.
- 2. Basis of Payment: Linear footage installed times the unit price per linear foot.
  - a. Includes placement, pipe materials, anchoring pipe, and maintaining during construction. Refer to Section 02610 for pipe requirements.
  - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for reevaluation.

# C. Rock Pipe Inlet Protection:

- 1. Basis of Measurement: Each unit placed.
- 2. Basis of Payment: Unit Price for each unit placed.
  - a. Includes labor and materials for cleaning, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, and maintaining during construction.

### D. Outlet Protection:

- 1. Basis of Measurement: Each unit placed.
- 2. Basis of Payment: Unit Price for each unit placed.
  - a. Includes labor and materials for cleaning, excavating, backfilling, placing embankment, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, and required grouting as indicated on Drawings, and maintaining.

## E. Silt Fencing:

- 1. Basis of Measurement: By the linear foot.
- 2. Basis of Payment: Unit Price for each linear foot placed.
  - Includes labor and materials for furnishing, installing, and maintaining during construction.

### F. Silt Fence Outlets:

- 1. Basis of Measurement: Each unit placed.
- 2. Basis of Payment: Unit Price for each unit placed.
  - a. Includes labor and materials for cleaning, placing rock, maintenance of silt fence outlet throughout construction including repair and replacement of aggregate if necessary, establishment of on-site aggregate stockpiles sufficient for maintenance purposes, and maintaining during construction.

# G. Check Dam:

- 1. Basis of Measurement: Each unit placed.
- 2. Basis of Payment: Unit Price for each unit placed.
  - a. Includes labor and materials for cleaning, excavating, backfilling, placing nonwoven geotextile fabric in accordance with Section 02674, placing rock, maintenance of check dam throughout construction including repair and replacement of aggregate if necessary, establishment of on-site aggregate stockpiles sufficient for maintenance purposes, and maintaining during construction.

## H. Straw Wattle:

- 1. Basis of Measurement: Each unit placed.
- 2. Basis of Payment: Unit Price for each unit placed.
  - a. Includes labor and materials for cleaning, excavating, backfilling, installing straw wattle, and maintaining during construction.

# I. Slope Matting:

- 1. Basis of Measurement: By the square yard.
- 2. Basis of Payment: Unit Price for each square yard placed.
  - a. Includes labor and materials for installing slope matting, and maintaining during construction.

## J. Grassing:

- 1. Basis of Measurement: By the Acre. Refer to Section 02924.
- 2. Basis of Payment: Unit Price for each acre seeded. Refer to Section 02924.

### K. Erosion Maintenance:

- 1. Basis of Measurement: Lump sum.
- 2. Basis of Payment: Lump sum
  - Includes labor and materials for performance of maintaining existing E&SC measures and performing all E&SC inspections as required by NCDENR throughout the construction.

### L. Erosion Closeout:

- 1. Basis of Measurement: Lump sum.
- 2. Basis of Payment: Lump sum
  - a. Includes labor and materials for performing an inspection 10 months after Substantial Completion (or when ground stabilization is sufficient) with the Owner and NCDENR Land Quality Section to close the Erosion and Sedimentation Control Plan and removing temporary E&SC measures and making any necessary repairs resulting from the inspection.

## M. Post-Construction Erosion Inspections and Repair:

- 1. Basis of Measurement: Lump sum.
- 2. Basis of Payment: Lump sum
  - a. Includes labor and materials for performing inspections at least weekly and after each 0.5-inch or greater rainfall event, as well as making any necessary repairs resulting from the inspections.

### 1.3 REFERENCES

#### A. ASTM International:

 ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

# 1.4 SUBMITTALS

A. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with requirements of these Project Specifications.
- B. Perform Work in accordance with NCDOT standards.

## 1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this Section.

# PART 2 PRODUCTS

## 2.1 RIPRAP AND GEOTEXTILE MATERIALS

- A. Riprap: As shown on Drawings and as specified in Section 02060. Furnish in accordance with NCDOT standards.
- B. Geotextile Fabric: Non-biodegradable, non-woven geotextile, 8 oz/sy, UV stabilized filter fabric as specified in Section 02674.

### 2.2 MATTING

A. Matting: As shown on Drawings.

### 2.3 DOWNDRAINS

A. Refer to Section 02610.

### 2.4 AGGREGATE AND SOIL MATERIALS

- Fine and Coarse Aggregate: As shown on Drawings and as specified in Section 02060.
- B. Soil Backfill: Soil Type S1 as specified in Section 02320. Subsoil with no rocks over 4 inches in diameter, frozen earth or foreign matter.

### 2.5 SILT FENCING

A. As specified on Drawings.

### 2.6 PLANTING MATERIALS

- A. Seeding and Soil Supplements: As specified in Section 02924.
- B. Mulch: As specified in Section 02924.

### PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verify compacted subgrade or granular base is acceptable and ready to support devices and imposed loads.
- B. Verify gradients and elevations of base or foundation for other work are correct.

## 3.2 CHANNELS

- Windrow excavated material on low side of channel.
- B. Place fill and compact to 95 percent of the maximum dry density as determined by ASTM D698.
- C. On entire channel area, apply soil supplements and sow seed as specified in Section 02924.
- D. Mulch seeded areas with straw as specified in Section 02924.
- E. Install channel lining as specified on Drawings.

### 3.3 OUTLET PROTECTION

- A. Excavate to indicated depth of rock lining or nominal placement thickness as indicated on Drawings. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a

minimum overlap of 2 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile. Place as indicated on Drawings.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution. Place evenly and carefully to minimize voids.
  - 1. Saturate rock with water and let all standing water drain. Fill voids between pieces with grout, were shown on Drawings, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.

### 3.4 SILT FENCING

A. Install as specified on Drawings.

## 3.5 SILT FENCE OUTLETS

A. Locations as indicated on the Drawings and may be field-adjusted with Engineer's approval.

### 3.6 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed heights indicated on the drawings. Slope stockpile sides at 2(H): 1(V) or flatter or as otherwise indicated on the Drawings. Stockpiles shall be graded to promote positive drainage.
- D. Stabilize any disturbed areas as specified in the seeding specifications.
  - 1. During non-germinating periods, apply mulch at recommended rates.
  - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 02924 and as specified on Drawings for temporary seeding.
  - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 02924 permanent seeding specifications.
- E. Stabilize diversion channels and stockpiles immediately.

## 3.7 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event in accordance with applicable North Carolina regulations. Perform additional inspections as required by the Self-Inspection Program. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Compaction Testing: As specified in Section 02320.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

## 3.8 CLEANING

- A. Remove and dispose of sediment when sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, or as indicated on the Drawings.
- B. Do not damage structure or device during cleaning operations. Any damage caused by cleaning operations shall be repaired at no cost to the Owner.
- C. Do not permit sediment to erode into construction or site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one half channel depth.
- E. Do not damage channel or channel lining material during cleaning operations.

# 3.9 SCHEDULES

A. As indicated on Drawings.

## SECTION 02610 PIPE CULVERTS

#### PART 1 GENERAL

## 1.1 SUMMARY

- A. Section includes:
  - 1. HDPE corrugated, smooth interior stormwater pipe.
  - 2. Joints and accessories.
- B. Related Sections
  - 1. Section 02374 Erosion Control Devices.

## 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Pipe Culvert:
  - 1. Basis of Measurement: Included with Section 02374.
  - 2. Basis of Payment: Included with Section 02374.

## 1.3 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
  - 2. ASTM F405 Standard Specification for Corrugated Polyethylene Pipe and Fittings.
  - 3. ASTM F667 Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

### 1.4 SUBMITTALS

- A. Product Data: Submit data on pipe, fittings and accessories.
- B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

## 1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record location of pipe runs, connections, and invert elevations via survey information.

### PART 2 PRODUCTS

- 2.1 HDPE Corrugated Stormwater Pipe
  - A. Stormwater pipe shall be HDPE corrugated, smooth interior pipe as manufactured by ADS (N-12) or engineer approved equivalent, meeting the requirements of ASTM F405 and ASTM F667 or as otherwise shown on the drawings.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Excavate pipe trench. Hand trim excavation for accurate placement of pipe to elevations indicated.

- B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.
- C. Perform temporary dewatering as necessary to keep bearing soils from softening.
- D. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

### 3.2 INSTALLATION - PIPE

- A. Place pipe in trench and ensure pipe remains in correct position and to required slope with necessary support.
- B. Install backfill at sides and over top of pipe. Install top cover to minimum compacted thickness of 18 inches.
- C. Refer to Section 02320 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- D. Installation of HDPE pipe shall be in accordance with ASTM D2321, the manufacturer's recommendations, and as described elsewhere in these specifications.
- E. Install pipe anchoring as indicated on the drawings.

## 3.3 ERECTION TOLERANCES

- A. Lay pipe to alignment and slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.
- B. Maximum variation from intended elevation of culvert invert: 1/2 inch.
- C. Maximum offset of pipe from indicated alignment: 1 inch.
- D. Maximum variation in profile of structure from Intended Position: 1/2 percent.

### 3.4 FIELD QUALITY CONTROL

- A. Request inspection prior to placing backfill over pipe.
- B. Compaction Testing: In accordance with Section 02320.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

# 3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect pipe and cradle from damage or displacement until backfilling operation is in progress.

## SECTION 02674 NONWOVEN GEOTEXTILES

## PART 1 - GENERAL

## 1.1 SUMMARY

#### A. Section Includes:

- 1. Nonwoven geotextile for:
  - a. Sub-base for outlet protection.

# B. Related Sections:

- 1. Section 02060 Aggregate.
- 2. Section 02374 Erosion Control Devices.

### 1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

### A. Geotextile

- 1. Basis of Measurement: Included with Section 02374.
- 2. Basis of Payment: Included with Section 02374.

### 1.3 REFERENCES:

### A. American Society for Testing and Materials (ASTM) standards

- 1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
- 2. ASTM D3786 Standard Test Method for Hydraulic Burst Strength of Knitted Goods and Non-woven Fabrics (Diaphragm Bursting Strength Tester Method).
- 3. ASTM D4354 Practice for Sampling of Geosynthetics for Testing.
- 4. ASTM D4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
- 5. ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity.
- ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- 7. ASTM D4533 Test Method for Trapezoidal Tearing Strength of Geotextiles.
- 8. ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles.
- 9. ASTM D4759 Practice for Determining the Specification Conformance of Geosynthetics.
- 10. ASTM D4873 Guide for Identification, Storage and Handling of Geotextiles.
- 11. ASTM D5261 Test Method for Measuring Mass per Unit Area of Geotextiles.
- 12. ASTM D5321 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
- 13. ASTM D6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

### 1.4 SUBMITTALS

## A. Manufacturer's Product Information

- 1. As part of their bid, the Contractor shall submit for the geotextile to be used:
  - a. Name of manufacturer.
  - b. Product name.
  - c. Style number.
  - d. Chemical composition of the filaments and yarns.

- e. Product data sheets.
- f. Manufacturer's installation instructions.
- 2. Submit the results of factory testing to the Construction Quality Control Office (CQAO) prior to initiating field work.
- 3. A written certificate from the Geotextile Manufacturer stating that the materials supplied are in compliance with this Specification:
  - a. The manufacturer's certificate shall state that the finished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program and that these values are guaranteed by the geotextile manufacturer.
  - b. The information supplied shall be in the form of a factory quality control certificate for each roll and shall include the following:
    - 1) Lot, batch, or roll numbers and identification.
    - 2) Length and width of each roll.
    - 3) Date each roll was manufactured.
    - 4) Sampling procedures.
    - 5) Geotextile must meet the minimum required physical properties for geotextile specified in Table 02674-A found in this Section 02674.
  - c. A person having legal authority to bind the manufacturer shall attest to the certificate.
- 4. Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with these Specifications.
- B. Any geotextile sample that does not comply with this Section 02674 shall result in rejection of the roll from which the sample was obtained. The Contractor shall replace any rejected rolls at no additional cost to Owner.
- C. If a geotextile sample fails to meet the quality control requirements of this Section 02674, the Contractor shall require that the Geotextile Manufacturer sample and test each roll manufactured in the same lot or batch, or at the same time, as the failing roll. Sampling and testing of rolls shall continue until a pattern of acceptable test results is established.
- D. General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.
- E. The Manufacturer shall be a well-established firm with more than two years experience in the manufacture of geotextiles.
- F. The Contractor shall be trained and qualified to install geotextiles.
- G. The engineer shall monitor the geotextile rolls upon delivery to the site and report any deviations from project specifications to the Contractor.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Geotextile labeling, shipment, and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show:
  - 1. Manufacturer or supplier name.
  - 2. Product identification.
  - 3. Lot or batch number.
  - 4. Roll number.

- 5. Roll dimensions (length and width).
- C. If any special handling is required, it shall be so marked on the geotextile itself; e.g., "This Side Up" or "This Side Against Soil to be Retained."
- D. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- E. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, ultraviolet sunlight, mud, dust, puncture, and other damaging deleterious conditions. The protective wrapping shall be maintained during periods of shipment and storage.
- F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.
- G. Transport and handle geotextile with equipment designed to protect it from damage. Equipment used to unload, stack or transport geotextile shall not damage protective wrap or geotextile.
- H. Upon delivery at the job site, the Contractor shall ensure that the geotextile rolls are handled and stored in accordance with the manufacturer's instructions as to prevent damage.
- I. The geotextile rolls shall not be stacked more than three rolls high or as otherwise recommended by the Manufacturer.
- J. Do not use materials damaged during storage or handling. If the geotextile is not packaged and a roll is damaged during shipment, it shall be rejected.
- K. If only the outermost surface of the roll is affected, it may be peeled back, cut, and wasted if approved by the Engineer (i.e., it shall be treated as if it were the protective packaging for the remainder of the roll).
- L. The geotextile shall be relatively free of holes or any sign of contamination by foreign matter. The Engineer may reject all or portions of units (or rolls) of the geotextile if in his opinion significant quantities of production flaws are observed.
- M. The Contractor shall take any necessary precautions to prevent damage to other portions of the Work during placement of the geotextile.

## 1.7 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

### **PART 2 PRODUCTS**

## 2.1 GEOTEXTILE

A. Nonwoven geotextile shall be that which is specified on the Drawings. Unless otherwise noted on the Drawings, geotextile suppliers shall furnish materials whose Minimum Average Roll Values

meet or exceed the criteria specified in Table 02674-B. The Manufacturer shall provide test results for these procedures, as well as a certification that the material properties meet or exceed the specified values.

- 1. Minimum Average Roll Value (MARV) shall be based on Manufacturer's data and shall be calculated as the mean value of the property of interest plus or minus two standard deviations, as appropriate.
- 2. Where material properties vary among the machine and cross-machine directions, the MARV shall apply to the direction providing the lowest value (when a minimum is specified) or the highest value (when a maximum value is specified).
- B. The geotextiles provided by the supplier shall be stock products.
- C. The geotextile shall be:
  - 1. Nonwoven, needlepunched, continuous filament polyester material; or
  - 2. Nonwoven, needlepunched, continuous filament polypropylene material; or
  - 3. Nonwoven, needlepunched, polypropylene staple or continuous fiber material.
- D. The geotextile shall be manufactured from first quality virgin polymer.
- E. The supplier shall not furnish products specifically manufactured to meet the specifications of this project unless authorized by the Owner and Engineer.
- F. In addition to the property values listed in Table 02674-B, the geotextiles shall:
  - 1. Retain its structure during handling, placement, and long-term service.
  - 2. Be capable of withstanding outdoor exposure for a minimum of 30 days with no measurable deterioration.

# TABLE 02674-A GEOTEXTILE REQUIRED PHYSICAL AND HYDRAULIC PROPERTIES

PROPERTIES AND REQUIREMENTS <sup>(1,2)</sup>	UNITS	SPECIFIED VALUES 6 oz.	SPECIFIED VALUES 8 oz.	SPECIFIED VALUES 10 oz.	SPECIFIED VALUES 12 oz.	TEST METHOD
Туре		Nonwoven	Nonwoven	Nonwoven	Nonwoven	
Mass Per Unit Area	oz/yd <sup>2</sup>	6.0	8.0	10.0	12.0	ASTM D5261
Grab Tensile Strength	lb	160	200	230	300	ASTM D4632
Grab Tensile Elongation	%	50	50	50	50	ASTM D4632
Trapezoid Tear Strength	lb	65	80	95	115	ASTM D4533
CBR Puncture Strength	lb	410	500	700	800	ASTM D6241
Apparent Opening Size (AOS)	US Sieve/ mm	70/0.212	80/0.18	100/0.15	100/0.15	ASTM D4751
Permittivity	sec <sup>-1</sup>	1.5	1.4	0.8	0.8	ASTM D4491
UV Resistance <sup>(3)</sup>	% strength retained	70	70	70	70	ASTM D4355

#### Notes:

- (1) All values represent minimum average roll values except for UV resistance, which is a minimum value.
- (2) Polymer composition of 95 % polypropylene or polyester by weight
- (3) Evaluation to be on 2.0 inch strip tensile specimen after 500 hours of exposure.

### PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Prior to implementing any geotextile work, the Contractor shall carefully inspect the subgrade and verify that all work is complete to the point where the installation of the geotextile may properly commence without adverse impact.
- B. If the Contractor has any concerns regarding the installed work, the Engineer and/or Owner shall be notified in writing within 48-hours of his site inspection. Failure to inform the Engineer and/or Owner in writing or installation of the geotextile will be construed as Contractor's acceptance of all prior related work.
- C. Any geotextile that does not comply with Table 02674-B of this Section 02674 shall be rejected and replaced with new material in accordance with the Specifications, at no additional cost to Owner.

## 3.2 PREPARATION

A. Prior to implementing any of the work described in this Section 02674, the Contractor shall become thoroughly familiar with all portions of the work within this Section 02674 or related work, as necessary for successful completion of the Work.

# 3.3 INSTALLATION

- A. The Contractor shall handle all geotextile in such a manner as to ensure they are not damaged in any way.
- B. The Contractor shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.

## 3.4 FIELD QUALITY CONTROL

- A. The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.
- B. Defects and Repairs:
  - 1. Any holes or tears in the geotextile shall be repaired with a patch made from the same geotextile. The patch shall be sewn in place with a minimum of 12 inches overlap in all directions.
  - 2. Care shall be taken to remove any soil or other material, which may have penetrated the torn geotextile.

# 3.5 PROTECTION OF FINISHED WORK

- A. The Contractor shall use all means necessary to protect all prior work and all materials and completed work of other Sections.
- B. The geotextile shall be covered as soon as possible after installation and approval. The geotextile shall not be exposed to precipitation prior to being installed and shall not be exposed to direct sun light for more than 20 days after installation.
- C. Placement of Overlying Material:
  - 1. Placement of the overlying material shall proceed immediately following placement and inspection of the geotextile
  - 2. The overlying material shall be placed on the geotextile in such a manner that ensures that:
    - a. The geotextile and underlying lining materials are not damaged.
    - b. Minimal slippage occurs between the geotextile and underlying layers.
    - c. Wrinkling of geosynthetics does not occur.
- D. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary at the expense of the responsible party, to the approval of the Engineer.
- E. Protect installed geotextile according to manufacturer's instructions. Repair or replace areas of damaged by scuffing, punctures, traffic, rough subgrade, or other unacceptable conditions.
- F. The Contractor shall not use heavy equipment to traffic above the geotextile without approved protection.

# SECTION 02924 SEEDING AND SOIL SUPPLEMENTS

### PART 1 GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Preparation of subsoil.
  - 2. Placing topsoil as needed.
  - 3. Seeding.
  - 4. Hydroseeding.
  - 5. Mulching.
  - 6. Fertilizing.
  - 7. Maintenance.

## B. Related Sections:

- 1. Section 02320 Backfill Structural.
- 2. Section 02374 Erosion Control Devices.

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

### A. Seeding:

- 1. Basis of Measurement: By the acre.
- 2. Basis of Payment: By the 2-dimensional acre seeded times the unit price for seeding.
  - a. Includes all labor, equipment and materials required to establish a permanent grass cover on all graded surfaces including, but not limited to preparation of subsoil, soil amendments, installation of erosion control matting, fertilizing, and seeding.
  - b. Includes fulfilling requirements of the maintenance agreement.
  - c. Includes any maintenance and protection required to control erosion on embankment fill surfaces prior to beginning permanent grassing operations.

## 1.3 REFERENCES

A. The State of North Carolina Erosion and Sediment Control Planning and Design Manual.

## 1.4 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

## 1.5 SUBMITTALS

- A. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.
- B. Soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs or a similar soil and nutrient testing laboratory.

## 1.6 CLOSEOUT SUBMITTALS

A. Seeding maintenance warranty.

### 1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Perform Work in accordance with North Carolina Erosion and Sedimentation Control Planning and Design Manual.

# 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

# **PART 2 PRODUCTS**

## 2.1 SEED MIXTURE

- A. Temporary Seed Mixture: As specified on Drawings.
- B. Permanent Seed Mixture: As specified on Drawings.

### 2.2 SOIL MATERIALS

A. Topsoil: Excavated from site, imported, and/or a blend thereof reasonably free of weeds as specified in Section 02320.

### 2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry and as described in the North Carolina Erosion and Sediment Control Planning and Design Manual.
- B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated by soil test results.
- C. Lime: Agricultural grade; recommended for grass; of proportion necessary to promote germination of seed as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated by soil test results.
- D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
- E. Erosion Fabric: Erosion control matting, as specified by the Engineer.

## PART 3 EXECUTION

# 3.1 EXAMINATION

- A. Verify prepared soil base is ready to receive the Work of this Section.
- 3.2 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Tracked soil surface shall be oriented up and down slopes and not parallel to slopes to help prevent erosion.

### 3.3 FERTILIZING

- A. Provide minimum fertilizer, lime, and nutrient addition as recommend by soil testing results to promote vigorous vegetative growth.
- B. Apply fertilizer after smooth raking of topsoil.
- C. Mix fertilizer thoroughly into upper 2 to 4 inches of soil.
- D. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

#### 3.4 SEEDING

- A. Stabilization and/or seeding must be completed per the erosion and sediment control permit requirements.
- B. Apply seed at rate as indicated on Drawings evenly in two intersecting directions and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Rake in lightly.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Planting Season: As indicated on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual.
- E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- F. Immediately following seeding, apply mulch to thickness as specified on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Maintain clear of shrubs and trees.
- G. Apply water with fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

### 3.5 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 2000 lbs per acre evenly in one pass.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

## 3.6 MAINTENANCE WARRANTY

- A. The contractor is responsible for providing a sufficient quality vegetation consistent with the engineers approved seeding mixture. The contractor shall be liable for maintenance, substantial growth and acceptance for a period of twelve months after Substantial Completion. The Owner shall retain a Maintenance Bond from the contractor in the amount of 15% of the total price of seeding for a period of twelve months after Substantial Completion.
- B. Vegetation shall be monitored by the Owner or Owners representative and the contractor during agreed upon dates. A corrective punch list and/or approval letter will then be formulated and given to the contractor for each review. If the vegetation is deemed of insufficient quality and/or erosion has occurred due to fault of the contractor, contractor will take corrective measures and or replace at no cost to the owner. Contractor liability for establishing vegetation does not include destructive acts by others including traffic, mowing, chemicals, all other physical activities and force majeure.

## C. Definitions:

- corrective measures may include any or all of the following: re-fertilizing, re-seeding, correcting
  erosion issues caused by insufficient vegetation.
- 2. *force majeure* acts of severe or abnormal conditions including but not limited to parasitic insects or fungi, wildfire, flooding, wind damage, or extreme drought as defined by the North Carolina Drought Management Advisory Council.
- 3. *owner's obligations* The Owner is obligated to monitor the vegetation at the frequency defined above. If corrective measures need to be taken, the owner is responsible for communicating to the Contractor the extent and location where corrective measures are necessary.
- 4. *sufficient quality of permanent vegetation* Permanent vegetation will be considered of sufficient quality if the following two conditions are met:
  - a. No bare spots are larger than 25 square feet
  - b. Bare spots make up less than 2% of total seeded area
- D. Terms and conditions of the maintenance warranty may be modified by a Notice of Change if agreeable to the Owner, Engineer, and Contractor.

## 3.7 SCHEDULE

A. As indicated on Drawings.